Valhalla Gas Exploration and Appraisal Program

Section 38 Assessment – Environmental Review Document

EPA Assessment Number 2281

BNR_HSE_MP_013

VERSION HISTORY				
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Approved for release	Name	Position	Signature	
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INVITATION TO MAKE A SUBMISSION

The Environmental Protection Authority (EPA) invites people to make a submission on the environmental review for this Proposal.

Bennett Resources Pty Ltd (BNR; Proponent) proposes to undertake an unconventional exploration drilling and hydraulic fracture stimulation (HFS) program within Petroleum Exploration Permit EP 371 (EP 371) within the Shire of Derby / West Kimberley.

The Proposal area is ~123 km southeast of the town of Derby. The Proposal involves constructing up to 20 wells in a region of the Canning Basin that has been previously surveyed and explored for petroleum purposes. The Proposal is targeting hydrocarbons present from the Laurel Formation through to the Devonian Formation, at depths ranging from 2,000 m to 5,000 m. The main target is the Laurel Formation, with hydrocarbons present between 2,000 m and 4,000 m below ground level. The Proposal will require an overall disturbance footprint of ~112 ha, with a clearing footprint of <110 ha.

The Environmental Review Document (ERD) has been prepared in accordance with the EPA's Procedures Manual (Part IV Divisions 1 and 2). The ERD is the report by the proponent on their environmental review; it describes this Proposal and its likely effects on the environment.

The ERD is available for a public review period of 8 weeks from 12 August 2024.

Information / submissions on the Proposal from the public may assist the EPA to prepare an assessment report in which it will make recommendations on the Proposal to the Minister for Environment.

WHY WRITE A SUBMISSION?

The EPA seeks information that will inform the EPA's consideration of the likely effect of the Proposal, if implemented, on the environment. This may include relevant new information that is not in the ERD, such as alternative courses of action or approaches.

In preparing its assessment report for the Minister for Environment, the EPA will consider the information in submissions, the proponent's responses, and other relevant information.

Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the Western Australian (WA) *Freedom of Information Act 1992*.

WHY NOT JOIN A GROUP?

It may be worthwhile joining a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

DEVELOPING A SUBMISSION

You may agree or disagree with, or comment on information in the ERD.

When making comments on specific elements in the ERD:

- clearly state your point of view and give reasons for your conclusions
- reference the source of your information, where applicable
- suggest alternatives to improve the outcomes on the environment.

WHAT TO INCLUDE IN YOUR SUBMISSION

Include the following in your submission to make it easier for the EPA to consider your submission:

- your contact details – name and address
- date of your submission
- whether you want your contact details to be confidential
- summary of your submission if your submission is long

- list points so that issues raised are clear, preferably by environmental factor
- refer each point to the page, section, and if possible, paragraph of the ERD
- attach any reference material, if applicable. Make sure your information is accurate.

The closing date for public submissions is: 7 October 2024.

The EPA prefers submissions to be made electronically via the EPA's Consultation Hub at https://consultation.epa.wa.gov.au.

Alternatively, submissions can be:

- posted to: Chairman, Environmental Protection Authority, Locked Bag 10, Joondalup DC WA 6919, or
- delivered to: Environmental Protection Authority, Prime House, 8 Davidson Terrace, Joondalup WA 6027.

If you have any questions on how to make a submission, please contact the EPA Services at the Department of Water and Environmental Regulation on 08 6364 7000.

ACKNOWLEDGEMENT OF TRADITIONAL CUSTODIANS

BNR would like to acknowledge the Traditional Owners of the land on which BNR works. BNR pays its respects to Elders past, present, and emerging.

Disclaimer

Information presented in this document is correct at the time of writing.

Scoping – required work checklist

An Environmental Scoping Document (ESD) checklist is provided below to demonstrate that the ESD requirements have been met and lists where the relevant ESD information is located in this Environmental Review Document (ERD).

Environmental Scoping Document (ESD) checklist

ESD requirement	Description	Further information
1.	Characterise the surface water and groundwater systems in a local and regional context and describe recharge and discharge mechanisms, aquifer connectivity, surface water/groundwater interaction and water chemistry. This should include identification and mapping of groundwater and surface water dependent ecosystems, and detail of the location of wells in relation to surface water features (e.g. Le Lievre Swamp, permanent/semi-permanent pools etc.).	Section 5.4.3 Appendix M
2.	Undertake baseline groundwater level and water quality monitoring at representative sites that reflect the expected conditions of each well, including a comprehensive list of analytes including geogenic chemicals, radon and methane concentrations, for a minimum of 24 months prior to commencing the Proposal that is at least consistent with the Guideline for groundwater monitoring in the onshore petroleum and geothermal industry (Department of Mines and Petroleum and Department of Water, 2016).	Section 5.4.3.3 Appendix M
3.	Analyse, describe and assess surface water and groundwater impacts, including direct, indirect and cumulative impacts, from the project. This should include, but not be limited to: a. changes to groundwater levels and surface water flows associated with the Proposal; b. changes to water quality; c. the nature, extent and duration of impacts; and d. impacts on environmental values of ground and surface water dependent ecosystems.	Section 5.4.5 Section 7.1
4.	Discuss the proposed management, monitoring and mitigation to ensure impacts on inland water quality and environmental values are not greater than predicted as a result of implementing the Proposal. This should include but not be limited to: a. ecotoxicology testing on produced or flowback water to better assess the potential impacts; b. a groundwater level and groundwater quality monitoring plan for the duration of the petroleum development activity and post closure, including concentrations of methane and of chemical constituents that are indicative of brine incursions; c. surveillance monitoring of groundwater level and groundwater quality for the duration of petroleum development activity; d. testing for, and assessment of the risk from a comprehensive list of analytes in groundwater, likely in produced and flowback water, including geogenic chemicals, technologically enhanced naturally occurring radioactive materials and radon; e. a site water balance, accounting for water produced, evaporated, and disposed of, to enable detection of significant leakage of fluids and determine whether remedial action to track any contaminants is warranted; and f. proposed management of flowback water, including volumes of water that can be expected to be produced. If open air pits are proposed, risks to groundwater and surface water resources arising from leaky pit membranes or other pond failures should be addressed, and the monitoring required to identify and remediate leakages. If re-injection is proposed, the depth of re-injection and detailed construction details of injection wells should be provided.	Section 5.4.6 Appendix F Appendix M
5.	**Chemicals** Identify all chemicals intended to be used as ingredients in drilling and hydraulic fracture fluids.	Appendix A
6.	Provide the Chemical Abstracts Service (CAS) number for the chemicals, and evidence that the chemicals are approved for their intended use in Australia and listed on the: a. Australian Inventory of Chemical Substances (AICS); b. Australian Pesticides and Veterinary Medicines Authority (APVMA); c. Therapeutic Goods Administration (TGA); or d. Food Standards Australia and New Zealand (FSANZ) inventories.	Appendix A

ESD requirement	Description	Further information
7.	Provide material safety data sheets (SDS) for the chemicals identified.	Appendix A
8.	Confirm whether any chemicals intended to be used contain Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) or Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS).	Appendix A
9.	Identify if chemicals proposed to be used are known or suspected carcinogens, mutagens, developmental toxicants, and endocrine disruptors. Use of chemicals with these properties should be minimised or avoided in all operations.	Appendix A
10.	Identify the cumulative, short and long-term public health and environmental risks from chemicals used in drilling and fracturing fluids and chemicals expected to be present in produced and flowback water.	Section 3.4 Appendix N
11.	The Western Australian Department of Health (DoH) should review and provide advice on the information and risk assessments provided for chemicals proposed to be used in hydraulic fracture stimulation, or expected to be present in produced or flowback water.	Section 5.8 Appendix N
12.	**Geotechnical risks** Undertake and provide a comprehensive geotechnical risk analysis, including: a. definition of subsurface state of stress; b. definition of the structural context; c. identification of any hydrogeologically active faults or fracture zones; d. assessment of well-seal effectiveness; e. appropriate expertise; and f. delineation of potential high-risk zones	Section 5.4.5 Appendix B
13.	Provide details of an appropriate early warning system mechanism to prevent adverse geo-mechanical events reaching a size of any consequence to land or hydrogeology.	Section 5.4.6 Appendix B
14.	**Well Integrity** Well design, construction, stimulation, operation, and decommissioning are all addressed by International Standards Organisation (2017; ISO 165301), which encompasses each phase of the life of any oil and gas well. The Proposal must meet or exceed ISO 165301. The following should be provided: a. details of the well integrity management system over the entire Proposal lifecycle; b. a risk assessment process for well barrier integrity, identifying appropriate remedial action should a well barrier be compromised; and c. details of a well integrity testing and validation program.	Section 1.4.3.2 Section 2.5 Section 5.4.6
15.	Provide confirmation that well design, construction, and testing will be assessed by an independent, certified well examiner, reporting to the regulator as a required part of commissioning, licensing, and decommissioning.	Section 5.4.6
16.	Demonstrate how the mitigation hierarchy of avoid, minimise, mitigate has been applied during the planning and design stages of the Project.	Section 5.4.6
17.	Demonstrate and document in the ERD how the EPAs objective for this factor can be met.	Section 5.4.7
18.	**Decommissioning** Include details of the entire life cycle of oil and gas wells, from establishment to decommissioning, including all supporting activities related to hydraulic fracture stimulation. Rehabilitation, decommissioning and well-monitoring post-decommissioning should include evaluating factors such as: a. life cycle of well from establishment to decommissioning; b. land use post-decommissioning, developed in consultation with relevant stakeholders; c. disposal of contaminated wastes, including the management of potentially radioactive drill cuttings and wastewater in a manner that is consistent with the requirements of the Radiological Council; d. storage pond and site rehabilitation; e. well-monitoring and groundwater monitoring post-decommissioning to ensure no leakage, fugitive emissions, contamination; and f. monitoring trigger-levels for intervention and commitment to immediate remediation if contamination is detected.	Section 2.4.5 Section 2.5 Section 2.6 Monitoring Program (Appendix E)

ESD requirement	Description	Further information
19.	In accordance with the requirements of EPA Guidance, conduct a desktop study to identify and characterise the fauna and fauna habitats to inform local and regional context; and based on the results of the desktop study: a. conduct a Basic survey and fauna habitat assessment; and/or b. conduct a Detailed survey; and/or c. conduct targeted surveys for significant fauna that may be directly or indirectly impacted. *Note: The desktop study, surveys and ERD should consider vertebrates and short-range endemic, and/or other significant, invertebrates. Survey design should ensure that adequate local and regional contextual data are collected and should consider cumulative impacts. Surveys should include sites in both impact and non-impact (reference) areas.*	Section 5.3.3 Appendix C
20.	Demonstrate how surveys are relevant, representative, and consistent with current EPA policy and guidance and this Environmental Scoping Document.	Appendix C
21.	Provide a map of the survey effort applied in relation to the fauna habitats, the study area, Development Envelope, identifying the direct and indirect impact areas.	Figure 5-1
22.	Identify and describe the fauna assemblages present and likely to be present within the Development Envelope that may be impacted by the Proposal.	Section 5.3.3
23.	Identify and describe the characteristics of the fauna habitats identified by the desktop study and surveys, including a map their extents in relation to the study area, the project area, and direct and indirect impact areas. Describe significant habitats, including but not limited to: refugia, breeding areas, key foraging habitat, movement corridors, and linkages.	Section 5.3.3.1 Appendix C
24.	Identify significant fauna and describe in detail their known ecology, likelihood of occurrence, habitats, and known threats. Map the locations of significant fauna records in relation to the fauna habitats, the study area, the Development Envelope, and direct and indirect impact areas.	Section 5.3.3.1 Section 5.3.3.2 Section 5.3.3.3 Figure 5-8
25.	Identify, describe and quantify the potential residual impacts (direct, indirect and cumulative) to fauna assemblages, habitats, and significant species that may occur following implementation of the Proposal, after considering and applying avoidance and minimisation measures, in a local and regional context. Provide a table of the proportional extents of each habitat within the study area and Development Envelope, and the predicted amount to be directly and indirectly impacted.	Section 5.3.5 Table 5-16 Figure 5-11 Figure 5-12 Section 7.2
26.	Outline and justify the proposed avoidance and mitigation measures to reduce the potential impacts of the Proposal. If any significant species are expected to be impacted, include proposed management and/or monitoring plans that will be implemented pre- and post-construction to demonstrate and ensure residual impacts are not greater than predicted. Management and/or monitoring plans may be required and if so, are to be presented in accordance with the EPAs Instructions.	Section 5.1.6
27.	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (p. 11) and Western Australian Environmental Offsets Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014) and include reference to the Commonwealth Assessment Guide for any Matters of National Environmental Significance (MNES).	Section 5.3.7 Section 5.11.2
28.	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and WA Environmental Offsets Guidelines and, where impacts relate to EPBC Act-listed taxa, the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy. Spatial data defining the area of significant residual impacts should be provided.	Section 5.3.7 Section 5.11.2
29.	Demonstrate and document in the ERD how the EPAs objective for these factors can be met.	Section 5.3.7
30.	Identify and characterise the flora and vegetation of areas that may be directly or indirectly impacted by the Proposal, in accordance with Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment. Surveys should be designed to inform local and regional context. Specimens of significant flora collected during surveys should be vouchered at the WA Herbarium.	Section 5.1.3 Appendix C
31.	Demonstrate how surveys are relevant, representative, and demonstrate consistency with current EPA policy and guidance. Ensure database searches and taxonomic identifications are up to date. If multiple surveys have been undertaken to support the assessment, a	Section 5.1.3 Appendix C

ESD requirement	Description	Further information
	consolidated report should be provided including the integrated results of the surveys. All surveys should be appended to the environmental review documentation.	
32.	Provide a figure depicting survey effort applied in relation to the study area and Development Envelope, identifying the direct and indirect impact areas.	Figure 5-1
33.	Determine whether any flora species recorded are significant, and provide an analysis of local and regional context, (refer to *Environmental Factor Guideline – Flora and Vegetation* for definition of significant flora).	Section 5.1.3.6 Section 5.1.3.6
34.	Determine whether any vegetation identified is significant, and provide an analysis of local and regional context, (refer to *Environmental Factor Guideline – Flora and Vegetation* for definition of significant vegetation).	Section 5.1.5.1
35.	Provide figures depicting the recorded locations of flora and vegetation in relation to the Development Envelope in accordance with EPA *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*.	Figure 5-2 Appendix C
36.	Assess the potential direct and indirect impacts of the construction and operational elements of the Proposal on identified environmental values. Describe and assess the extent of cumulative impacts as appropriate.	Section 5.1.5 Section 7.3
37.	Provide a quantitative assessment of impact: a. For significant flora, this includes: i. number of individuals and populations in a local and regional context; ii. numbers and proportions of individuals and populations directly or potentially indirectly impacted; and iii. numbers/proportions/populations currently protected within the conservation estate (where known). b. For all vegetation units (noting threatened and priority ecological communities and significant vegetation) this includes: i. area (in hectares) and proportions directly or potentially indirectly impacted; and ii. proportions/hectares of the vegetation unit currently protected within conservation estate (where known).	N/A refer to Section 5.1.5.1
38.	Describe the application of the mitigation hierarchy in the Proposal design, construction, operation, and decommissioning. Detail actions undertaken to avoid, minimise, and mitigate Proposal impacts. If any conservation significant species are expected to be impacted include management and/or monitoring plans to be implemented pre and post-construction to demonstrate that residual impacts are not greater than predicted.	Section 5.1.6
39.	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (page 11) and the Western Australian Environmental Offsets Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014) and include reference to the Commonwealth Assessment Guide for any MNES.	Section 5.1.7 Section 5.11
40.	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the *WA Environmental Offsets Policy* and *Guidelines*. Spatial data defining the area of significant residual impacts for each environmental value should also be provided (e.g. vegetation type, vegetation condition, specific fauna species habitat).	Section 5.1.7 Section 5.11
41.	Demonstrate how the EPAs objective for this factor has been addressed.	Section 5.1.7
42.	Characterise the surrounding land use and amenity values in, and adjacent to the Proposal Area with a focus on the sensitive receptors and important areas for human use that could be affected by noise and dust emissions, traffic, and amenity issues. Include relevant maps to show the locations of the sensitive receptors likely to be affected by the Proposal.	Section 5.5.3
43.	Provide a collation of baseline information and processes to ensure the documentation and systematic monitoring of matters relating to amenity and aesthetics.	Section 5.5.3.3 Section 5.5.6
44.	**Noise** Undertake a site-specific noise assessment in accordance with EPA and contemporary guidance. Demonstrate that noise can be managed such that it complies the Environmental Protection (Noise) Regulations 1997 at sensitive receptor locations.	Section 5.5.5.2 Appendix P
45.	Undertake and provide baseline site-specific noise level data.	Section 5.5.3.8 Appendix O

ESD requirement	Description	Further information
46.	Provide predictive modelling of noise emissions and impacts.	Section 5.5.5.2 Appendix P
47.	Provide ongoing monitoring and management covering the entire lifecycle of the Proposal.	Section 5.5.6
48.	Include an assessment of the cumulative impact of noise from hydraulic fracture stimulation and associated activities, on places within proximity to people and domestic animals and provide management options to minimise noise.	Section 5.5.5.2 Section 7.4
49.	**Traffic** Identify the types and sizes of trucks, the road upgrades required to accommodate operations and ensure the safety of other road users. Describe how BNR will engage with local government to ensure public roads are maintained to provide for the ongoing safety of road users	Section 5.5.5.4 Section 5.5.6
50.	Provide baseline road-use statistics measuring volumes of vehicle movement and type and provide details of monitoring of road use, throughout the lifecycle of the Proposal.	Section 5.5.3.9
51.	Reduce emissions from traffic by ensuring the regular maintenance of all vehicles.	Section 5.5.6
52.	**Health** Provide a peer-reviewed, site-specific human health risk assessment, addressing potential short and long-term health impacts of the Proposal that addresses health risks from: a. airborne chemicals; b. chemicals proposed to be used in drilling and hydraulic fracture stimulation; c. fluids and those expected to be present in produced or flowback water; d. storage and handling of drilling and hydraulic fracture fluids; and e. storage and disposal of drilling and hydraulic fracturing flowback fluids (including wastewater). *Note: Peer-reviewed, site-specific human health risk assessments will be provided to the Department of Health for comment.*	Section 3.4 Section 5.8 Appendix N
53.	Undertake a comprehensive local social impact analysis prior to commencement of activities, to understand and measure the social dimensions of change and its links to mental health and wellbeing, due to impacts from changes to the physical or biological surroundings.	Section 5.5.5.8
54.	Determine impacts to human health in relation to worker accommodation (particularly dust, water supply, wastewater disposal etc.) by using the Department of Health scoping tool.	Section 5.5.5
55.	**Dust** Undertake and provide baseline dust monitoring [minimum 12 months] prior to regulated activities.	Section 5.5.3.7
56.	Identify cumulative impacts from dust on local and regional ecosystems and public health.	Section 5.1.5.4 Section 5.5.5.1 Section 7.4
57.	Propose measures to minimise the generation of dust throughout all operations when compared to baseline monitoring.	Section 5.5.6
58.	**Heritage** Characterise and describe the social, cultural and heritage values within the Proposal area and any sensitive receptors that may be directly or indirectly impacted as a result of this Proposal. Identify sites of social significance within a regional context, in consultation with the Traditional Owners.	Section 5.5.3.1 Section 5.5.3.2 Section 5.5.3.5 Section 5.5.3.6
59.	Conduct investigations, including ethnographic, ethnobotanic, and archaeological surveys in consultation with the Traditional Owners, to determine the significance of potential impacts (direct, indirect and cumulative) to social surroundings as a result of this Proposal.	Section 5.5.3.5.2 Section 7.40
60.	Proposals likely to impact on Aboriginal heritage or significant sites must include an Aboriginal Heritage Management Plan developed in consultation with the Traditional Owners and the Department of Planning, Lands and Heritage. The Aboriginal Heritage Management Plan must: a. include input from Traditional Owners whose land is under consideration for petroleum development;	N/A no management plan required, refer to Section 5.5.3.5.2

ESD requirement	Description	Further information
	b. detail the role of the Traditional Owners in monitoring the condition and protection of their cultural heritage and significant sites; and c. be reviewed and deemed acceptable by the Department of Planning, Lands and Heritage.	
61.	Detail how cultural orientations will be made available to the Proposal employees and contractors to raise cultural awareness, including issues specific to Aboriginal heritage, and be undertaken by local Traditional Owner groups or their approved cultural awareness providers.	Section 5.5.6
62.	Describe and assess the potential impacts (direct, indirect and cumulative) to social surroundings as a result of changes to the environment from the Proposal giving consideration to Traditional Owners and Pastoral Stations and their activities on the land.	Section 5.5.5 Section 7.40
63.	Apply the mitigation hierarchy and discuss proposed objectives/outcomes, monitoring, management and mitigation measures including decommissioning and rehabilitation outcomes to be implemented to appropriately avoid and minimise impacts to social surroundings.	Section 5.6.6
64.	Demonstrate and document how the EPA's objective for this factor can be met.	Section 5.5.7
65.	Present a desktop soil quality assessment within the vicinity of the well pads.	Section 5.2.3
66.	Include in the ERD, figures of the mapped soil units and soil profile.	Figure 5-8 Figure 5-9 Appendix F Appendix G
67.	Describe the proposed management, monitoring and mitigation methods to be implemented to address direct and indirect impact on soils/lands/receiving environment. This description is to include soil handling methods to mitigate erosion, compaction, and contamination and soil quality monitoring to inform site reinstatement activities.	Table 5-10 Appendix E
68.	Develop a suitable soil quality monitoring program for each well, documented within the ERD that includes: • A comprehensive list of analytes proposed to be collected, • A scientifically justified baseline monitoring program (including extent and duration of the program), • Trigger and threshold contingency actions	Appendix E
69.	Predict residual impacts after considering the mitigation hierarchy.	Section 5.2.5 Section 5.2.7
70.	Provide a waste management strategy, including methods for segregating wastes and appropriate disposal arrangements with licensed facilities. Wastes associated with hydraulic fracture stimulation requiring evaluation and management include drilling fluid, rock cuttings, flowback fluid, and produced formation water.	Section 2.6 Table 2-8
71.	Undertake and provide baseline air quality monitoring for volatile organic compounds and dust for a minimum of 12 months prior to commencing the Proposal.	Section 5.6.3 Appendix H
72.	Provide a site-specific air quality risk assessment.	Section 5.6.5
73.	Describe the proposed management, monitoring and mitigation methods to be implemented to address direct and indirect impact on air quality, including undertaking ongoing monitoring of dust and volatile organic compounds.	Section 5.6.6 Appendix E
74.	Provide credible estimates of scope 1, scope 2 and scope 3 greenhouse gas emissions (annual and total) in tonnes of carbon dioxide equivalent (CO_2-e) over the life of the Proposal. Detail methods used to estimate emissions.	Section 5.7.5.1 Appendix R
75.	Provide a breakdown of estimated scope 1 and scope 2 greenhouse gas emissions in tonnes of CO_2-e by all sources. Consider all proposed activities in determining the sources of emissions (e.g. clearing of land, site preparations, drilling operations, hydraulic fracture stimulation operations including flaring, potential leakage etc.).	Section 5.7.5.1
76.	Provide calculations and calculation methodology for determining estimated emissions of CO_2-e for all sources.	Section 5.7.5.1 Appendix R

ESD requirement	Description	Further information
77.	Benchmark the Proposal's emissions against other hydraulic fracture stimulation exploration projects. Information which supports that the identified projects are comparable to the Proposal should be included.	Section 5.7.5.1
78.	Provide a greenhouse gas management plan, in accordance with EPA guidance, which demonstrates the Proposal's trajectory towards net zero emissions by 2050. The plan should include at a minimum: a. information required by 74 to 77 above. b. a graph and table showing regular targets reflecting an incremental reduction in emissions towards net zero emissions by 2050. Where the proposed emissions reduction targets do not demonstrate a trajectory towards net zero by 2050, articulate clearly a compelling reason why it is not possible to achieve this. c. mitigation (avoidance, reduction, offset) measures to be implemented with associated timeframes and evidence to demonstrate that the interim and long-term targets will be met. Where it is proposed that, following implementation of the avoidance and reduction measures, authorised offsets will be applied to meet the targets, evidence which supports that the mitigation measures are capable of achieving the stated targets is still required. d. analysis of other potential abatement measures (e.g. renewables) relevant to the Proposal that are not proposed to be implemented which provides the rationale to support that these measures are unable to be implemented. e. reporting requirements for publicly and periodically reporting against the stated targets.	Appendix R
79.	Undertake and provide baseline measurements and monitoring for greenhouse gases, for a minimum of 12 months prior to any regulated activities.	Section 5.7.3
80.	Provide a monitoring and reporting program measuring atmospheric concentrations and process leakage of methane over every well's entire life cycle, with recognition that any detected leaks must be fixed by the operator.	Appendix E Appendix R
81.	Conduct a desktop assessment of the radionuclides and metals likely to be present in the geology of the Proposal area based on an interpretation of the site geology, exploration drilling data previously collected, and publicly available geophysical mapping. The assessment should explain if naturally occurring radionuclides and metals are likely to be of environmental significance or detrimental to human health during the development of the project and throughout operations.	Section 5.8.3
82.	Conduct an assessment of potential impacts to human health.	Section 5.8.5.1
83.	Outline the outcomes/objectives, management, monitoring, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted.	Appendix E
84.	Provide information on wastewater management on site.	Section 5.8.6 Section 2.6
85.	Discuss the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the Proposal has addressed the mitigation hierarchy in relation to impacts on human health.	Section 5.8.6 Appendix E
86.	Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.	Section 5.8.7
87.	Conduct a desktop assessment of the subterranean fauna and their habitat to inform local and regional context.	Section 5.9.3
88.	Undertake an assessment of potential impacts to Subterranean Fauna in accordance with EPA guidance.	Section 5.9.5
89.	Conduct an assessment of potential impacts from HFS activities to subterranean fauna. The assessment should explain if drill fluids or other chemicals of environmental significance are detrimental to subterranean fauna or their habitat.	Section 5.9.5
90.	Discuss the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the Proposal has addressed the mitigation hierarchy in relation to impacts on subterranean fauna.	Section 5.9.6
91.	Outline the outcomes/objectives, management, monitoring, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted.	Appendix E Section 5.4

ESD requirement	Description	Further information
92.	Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.	Section 5.9.7

This ERD was developed prior to the current versions of "Instructions: How to prepare an Environmental Review Document" (March 2024) and "Template: Environmental Review Document" (June 2023). Therefore, the structure of the document is slightly different. The below table lists the current instructions requirement and the relevant section in this document that covers that requirement.

ERD requirements as per Template: Environmental Review Document summary table

ERD Requirement	Section and Page
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Document Control	Cover Page
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Scoping - required work ESD	Page 3
Executive Summary	Section 1, Page 25-30
1.1 Proposal Content	Section 2, Page 53
1.2 Proposal Alternatives	Section 2.2.1, Page 53
1.3 Local and regional context	Section 2.7, Page 71
2. Legislative Context	Section 1.4, Table 1-2, Page 45
2.1 Environmental impact assessment process	Section1.4.1, Page 45
2.2 Other Approvals and regulation	Section 1.4.2– 1.4.7, 35 -52
3.1 Key Stakeholders	Section 3.2, Page 72
3.2 Stakeholder identification and engagement process	Section 3, Page 72
3.3 Stakeholder consultation outcomes	Section 3.4, Table 3-1, Page 75
4. Object and principals of the EP Act	Table 4-1, Page 63
5. Environmental factors and objectives	Section 4.2, Table 4.2 Page 80
5.1 EPA environmental factors and objectives	Section 5.1 and 5.1.1 Page 82 Section 5.2 and 5.2.1, Page 105 Section 5.3 and 5.3.1, Page 117 Section 5.4and 5.4.1, Page 132 Section 5.5 and 5.5.1, Page 171 Section 5.6 and 5.6.1, Page 198 Section 5.7 and 5.7.1, Page 207 Section 5.8 and 5.8.1, Page 212 Section 5.9 and 5.9.1, Page 215
5.2 Relevant policy and guideline	Section 5.1.2, Page 82 Section 5.2.2 Page 105 Section 5.3.2, Page 117 Section5.4.2, Page 132 Section 5.5.2, Page 171 Section5.6.2, Page 198 Section 5.7.2, Page 207 Section 5.8.2, Page 212 Section 5.9.2, Page 215
5.3 Receiving Environment	Section 5.1.3, Page 83 Section 5.2.3, Page 106 Section 5.3.3, Page 118

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11.2 Appendices	Appendix A – T, 245-265
11.3 Disclaimers	N/A
11.4 Index of Biodiversity Surveys for Assessments (IBSA) and Index of Marine Surveys for Assessment	IBSA Data packages have been prepared and submitted following EPA Guidance

EXECUTIVE SUMMARY

Overview of the Proposal

The Proposal is to undertake an unconventional exploration and appraisal drilling program within Petroleum Exploration Permit EP 371, located in the Canning Basin, West Kimberley of Western Australia (WA). The Proposal includes constructing up to 20 exploration and appraisal wells within 10 well sites.

The intent of the Proposal is to explore and further appraise the extent of the tight gas (natural gas produced from reservoir rocks with very low permeability requiring HFS) reservoirs present from the Laurel through to the Devonian Formations, at depths ranging from 2,000 m to 5,000 m below ground level. The main target is the Laurel Formation, with hydrocarbons present at below-ground depths between 2,000 m and 4,000 m.

The total area of the physical disturbance footprint for the Proposal is ~112 ha, which includes some previously disturbed areas. Conservatively, clearing of <110 ha is required for the Proposal, comprising:

- well sites ~41 ha
- access tracks ~62 ha (includes some pre-disturbed tracks)
- camps ~3 ha.

The estimated maximum amount of clearing for the Proposal is 110 ha. The exploration and appraisal program is expected to commence in the location and have the proposed extent of physical and operational elements, as listed below.

Element	Location	Proposed extent
Physical elements		
Clearing for well sites, access tracks and accommodation camps	Figure 1-2	No more than 110 ha
Gas exploration wells	Figure 1-2	No more than 20 wells at 10 well sites
Operational elements		
Water abstraction for process water and camp supply	Figure 1-2	100 ML per well via groundwater extraction bores
Gas exploration method	Not applicable (N/A)	Unconventional (hydraulic fracture stimulation [HFS])
Well design	N/A	Vertical wells with horizontal HFS wellbore sections
Hydraulic fracture stimulation intervals	N/A	Up to 70 intervals per well
Water retention pond	Figure 1-2	One pond per well site with a capacity of ~114,400 m^3, to hold raw bore water, then produced formation water
Well test flare pit	Figure 1-2	One per well site. Based upon availability of equipment at the time of undertaking operations, there is the option for a flare stack to combust gas off the separator
Project life	N/A	7 years

Summary of the environmental review

The EPA has defined 14 environmental factors and respective objectives, organised into 5 themes: Sea, Land, Water, Air, and People. With respect to the Valhalla Gas Exploration and Appraisal Program, and in accordance with the EPA's ESD, BNR has classified each environmental factor as either 'key' or 'not applicable' (Table 4-2), where:

- 'Key environmental factors' are those parts of the environment that may be impacted by an aspect of the Proposal
- 'Not applicable' are those parts of the environment that are not relevant to any aspect of the Proposal.

The assessment of potential environmental impacts focuses on the key environmental factors identified by BNR, which are further discussed in Sections 5.1 to 5.9. The Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia (Independent Scientific Panel Inquiry, 2018) presents the

potential risks arising from implementing HFS on the onshore environment of WA and recommendations that may be used to mitigate these risks.

The environmental assessments presented in the following sections have considered the outcomes of the inquiry and identified mitigation measures that are considered sufficient to satisfy these expectations.

Factor	Classification of factor	Further information
Theme: Sea		
Benthic communities and habitats	Not applicable	Not applicable
Coastal processes	Not applicable	Not applicable
Marine environmental quality	Not applicable	Not applicable
Marine fauna	Not applicable	Not applicable
Theme: Land		
Flora and vegetation	Key environmental factor	Section 5.1
Landforms	Not applicable	Not applicable
Subterranean fauna	Key environmental factor	Section 5.9
Terrestrial environmental quality	Key environmental factor	Section 5.2
Terrestrial fauna	Key environmental factor	Section 5.3
Theme: Water		
Inland waters	Key environmental factor	Section 5.4
Theme: Air		
Air quality	Key environmental factor	Section 5.6
Greenhouse gas emissions	Key environmental factor	Section 5.7
Theme: People		
Human health	Key environmental factor	Section 5.8
Social surroundings	Key environmental factor	Section 5.5

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ACRONYMS/DEFINITIONS

Acronym	Expansion/Definition
%	Percentage
%w/w	Percent weight per weight
~	Approximately
<	Less than / fewer than
>	Greater than / more than
µm	Micrometre. 1 µm = 10^{-6} metre = 0.000001 metre or one millionth of a metre
µS/cm	Microsiemens per centimetre
4WD	Four-wheel drive (vehicle)
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
AICS	Australian Inventory of Chemical Substances
ALARP	As Low As Reasonably Practicable
ANZECC	Australian and New Zealand Environment and Conservation Council
API	American Petroleum Institute
APVMA	Australian Pesticides and Veterinary Medicines Authority
AQ	Air Quality
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
ATU	Aerobic Treatment Unit
bbl	Barrel, a unit of volume for crude oil and petroleum products
BC Act	(WA) *Biodiversity Conservation Act 2016*
BDAC	Bunuba Dawangarri Aboriginal Corporation
BNR	Bennett Resources Pty Ltd
BoM	Bureau of Meteorology
Bq/L	Becquerel per litre; a measure of radioactive activity. In the case of drinking water, it is usual to talk about the radioactive concentration
BTEX	Compounds found in crude oil: benzene, toluene, ethylbenzene, and xylene
$CaCO_3$	Calcium carbonate
CAS	Chemical Abstracts Service
CH_4	Methane
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
CoPC	Contaminants of Potential Concern
COVID-19	Coronavirus disease 2019
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWE	(Commonwealth) Department of Agriculture, Water and the Environment
dB	Decibels
dB(A)	A-weighted decibels
DBCA	(WA) Department of Biodiversity, Conservation and Attractions
DCCEEW	(Commonwealth) Department of Climate Change, Energy, the Environment and Water (formerly DAWE)

Acronym	Expansion/Definition
DEC	Former (WA) Department of Environment and Conservation; now DBCA and DWER
DEMIRS	(WA) Department of Energy, Mines, Industry Regulation and Safety (from 1 December 2023)
DMIRS	Former (WA) Department of Mines, Industry Regulation and Safety
DMP	Former (WA) Department of Mines and Petroleum; now DEMIRS
DMPR	Former (WA) Department of Mineral and Petroleum Resources; now DEMIRS
DoH	(WA) Department of Health
DoIW	Directory of Important Wetlands
DoW	Former (WA) Department of Water (now DWER)
DPIRD	(WA) Department of Primary Industries and Regional Development
DPLH	(WA) Department of Planning, Lands and Heritage
DRF	Declared Rare Flora
DWER	(WA) Department of Water and Environmental Regulation
e.g.	For example
EC	Electrical Conductivity
EMP	Environmental Management Plan
EP	Environment Plan
EP Act	(WA) *Environmental Protection Act 1986*
EP 371	Exploration Permit 371
EPA	(WA) Environmental Protection Authority
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*
ERD	Environmental Review Document
ESA	Environmentally Sensitive Area
ESD	Environmental Scoping Document
etc.	Et cetera
FSANZ	Food Standards Australia and New Zealand
GDA	Geocentric Datum of Australia
GDE	Groundwater Dependent Ecosystems
GHG	Greenhouse Gas
GHGEMP	Greenhouse Gas Environmental Management Plan
GL	Gigalitre
GWMP	Groundwater Management Plan
ha	Hectare
HFC	Hydrofluorocarbon
HFS	Hydraulic Fracture Stimulation
HHRA	Human Health Risk Assessment
i.e.	That is
IBRA	Interim Biogeographic Regionalisation for Australia
ILUA	Indigenous Land Use Agreement
ISO	International Organization for Standardization
km	Kilometre
km/h	Kilometres per hour

Acronym	Expansion/Definition
km^2	Square kilometre
kWh	Kilowatt hour
L	Litre
L/s	Litres per second
LAUA	Land Access and Use Agreement
LoR	Limit of Reporting
m	Metre
m/s	Metres per second
m^2	Square metre
m^3	Cubic metre
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre
mg/m^3	Milligrams per cubic metre
ML	Megalitre (1,000,000 litres)
mm	Millimetre
mmscf/d	Million standard cubic feet per day, a unit of measurement for gases
MNES	Matters of National Environmental Significance (also referred to as matters of NES)
mS/m	Millisiemens per metre; a measure of electrical conductivity of a solution or soil and water mix that provides a measurement of salinity
MSDS	Material Safety Data Sheet (now referred to as SDS)
N	Nitrogen
N/A	Not applicable
N_2O	Nitrous oxide
NAFI	Northern Australian Fire Information
NATA	National Association of Testing Authorities
ND	Not Detected
NES	(matters of) National Environmental Significance
NGER	National Greenhouse and Energy Reporting
NGER Act	(Commonwealth) *National Greenhouse and Energy Reporting Act 2007*
NHMRC	National Health and Medical Research Council
NORM	Naturally Occurring Radioactive Material
NOx	Nitrogen oxides
NRMMC	Natural Resource Management Ministerial Council
NT	Not Tested
OM	Organic Matter
OSCP	Oil Spill Contingency Plan
PDWSA	Public Drinking Water Source Areas
PEC	Priority Ecological Community
PER	Public Environmental Review
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substance
PFC	Perfluorocarbon

Acronym	Expansion/Definition
PGER	Petroleum and Geothermal Energy Resources
PGER Act	(WA) *Petroleum and Geothermal Energy Resources Act 1967*
PGER(E)R	(WA) Petroleum and Geothermal Energy Resources (Environment) Regulations 2012
pH	Measure of acidity or basicity of a solution
PM	Particulate Matter
PM_{10}	Particulate Matter with a diameter of 10 µm or less
$PM_{2.5}$	Particulate Matter with a diameter of 2.5 µm or less
PMST	Protected Matters Search Tool
Proponent	Bennett Resources Pty Ltd
Proposal	Valhalla Gas Exploration and Appraisal Program
PSD	Particle Size Distribution
RIWI	Rights in Water and Irrigation
RNTBC	Registered Native Title Bodies Corporate
RNWS	Raising National Water Standards
SDS	Material Safety Data Sheet (formerly MSDS)
SDWK	Shire of Derby / West Kimberley
SF_6	Sulfur hexafluoride
SO_2	Sulfur dioxide
SRE	Short-range Endemic (species)
tCO_2-e	Tonnes of carbon dioxide equivalent
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TGA	Therapeutic Goods Administration
TOC	Total Organic Carbon. This refers specifically to the organic carbon fraction of soil
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
VOC	Volatile Organic Compound
WA	Western Australia
WAM	Western Australian Museum
WIR	Water Information Reporting
WMP	Well Management Plan
WoNS	Weeds of National Significance
WQPN	Water Quality Protection Note
YAI	Yungngora Association Inc. (leaseholder of Noonkanbah Station)
α	alpha
β	beta
γ	Gamma

1 Executive Summary

1.1 Purpose and scope

This Environmental Review Document (ERD) has been prepared to support the assessment of Bennett Resources Pty Ltd's (BNR) Valhalla Gas Exploration and Appraisal Program (the Proposal), under Section 39a of the Western Australian (WA) *Environmental Protection Act 1986* (EP Act). It provides information on environmental and regulatory approvals required (Section 1.4), Proposal characteristics (Section 2), potential environmental impacts and proposed mitigation measures (Section 5), and a cumulative (holistic) impact assessment (Section 5.6). This ERD has been prepared in accordance with the Environmental Protection Authority's (EPA) Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures (EPA, 2021a), Procedures Manual (EPA, 2021b), and Environmental Review Document Instructions (EPA, 2024).

The Proposal is to complete an unconventional exploration and appraisal drilling and hydraulic fracture stimulation (HFS) program on Petroleum Exploration Permit EP 371 (EP 371) in the Canning Basin, within the Shire of Derby / West Kimberley (SDWK) in WA. The intent of the Proposal is to evaluate the large tight gas resource in the region, which has the potential to offer long-term energy security to Australia. The onshore Canning Basin is an early Ordovician to early Cretaceous aged geological basin that covers ~430,000 km^2 in the West Kimberley region. The Proposal is targeting hydrocarbons present from the Laurel through to the Devonian Formations, at depths ranging from 2,000 m to 5,000 m below ground level. The main target is the Laurel Formation, with hydrocarbons present at depths between 2,000 m and 4,000 m below ground level.

Note, this Proposal does not cover gas production. It is an exploration and appraisal program only to be undertaken in two phases, being exploration then field appraisal (field appraisal being dependant on successful outcomes from exploration). Should a commercially viable resource be identified, BNR will seek additional approvals as required under both Federal and State Government legislation.

To note, all distances in this ERD are presented as straight-line geographic distances, unless otherwise stated.

The Development Envelope is ~123 km southeast of the town of Derby (Figure 1-1 and Figure 1-2). The Proposal involves constructing up to 20 wells in a region of the Canning Basin that has previously been surveyed and explored for petroleum purposes. Following well construction, HFS will be undertaken, if required, to appraise the hydrocarbon flow rates.

The Proposal includes these activities:

- site preparation
- drilling
- HFS
- site reinstatement (including ongoing management of the wells).

These activities are proposed to be undertaken in two stages over seven years. The overall expected disturbance footprint within the Development Envelope is ~112 hectares (ha).

The Traditional Owners of the land within the Development Envelope have a good understanding of and experience with HFS activities. They support the current Proposal and the ongoing appraisal and development of the resource. Section 3.2.3 provides additional information on the history of engagement with Traditional Owners. The boundaries of native title areas and community locations are shown in Figure 1-3.

1.2 Proponent details

The instrument holder and operator of EP 371 is Bennett Resources Pty Ltd (BNR), a wholly owned subsidiary of Black Mountain Energy Pty Ltd. BNR is the nominated operator for EP 371 and the proponent for the Proposal. Contact details are provided in Table 1-1.

Table 1-1: Proponent contact details

Position	Chief Operating Officer
Organisation	Bennett Resources Pty Ltd
Address	Level 4, 225 St Georges Terrace, Perth WA 6000
Email	perthoffice@blackmountainenergy.com

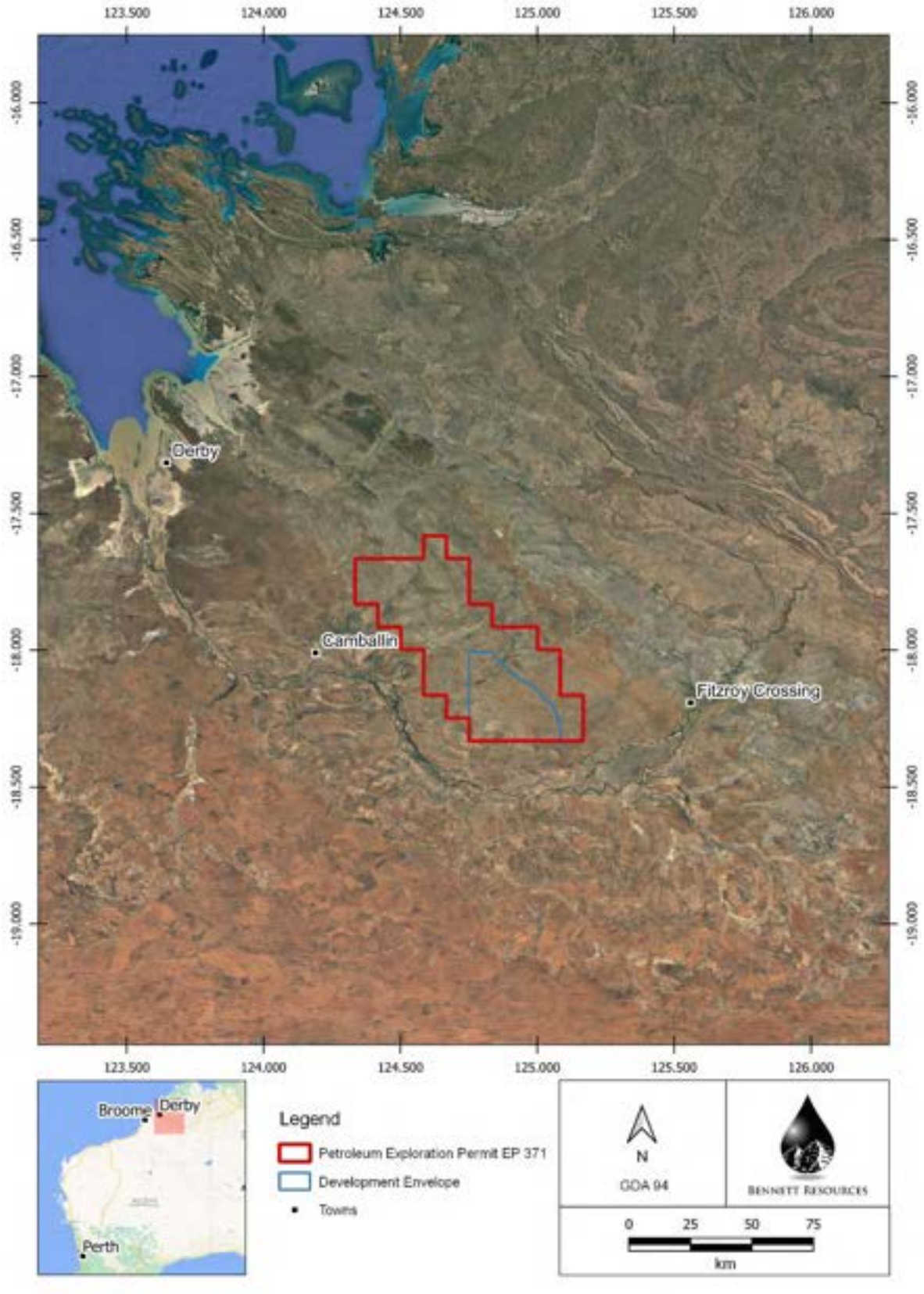

Figure 1-1: Regional location of the Development Envelope

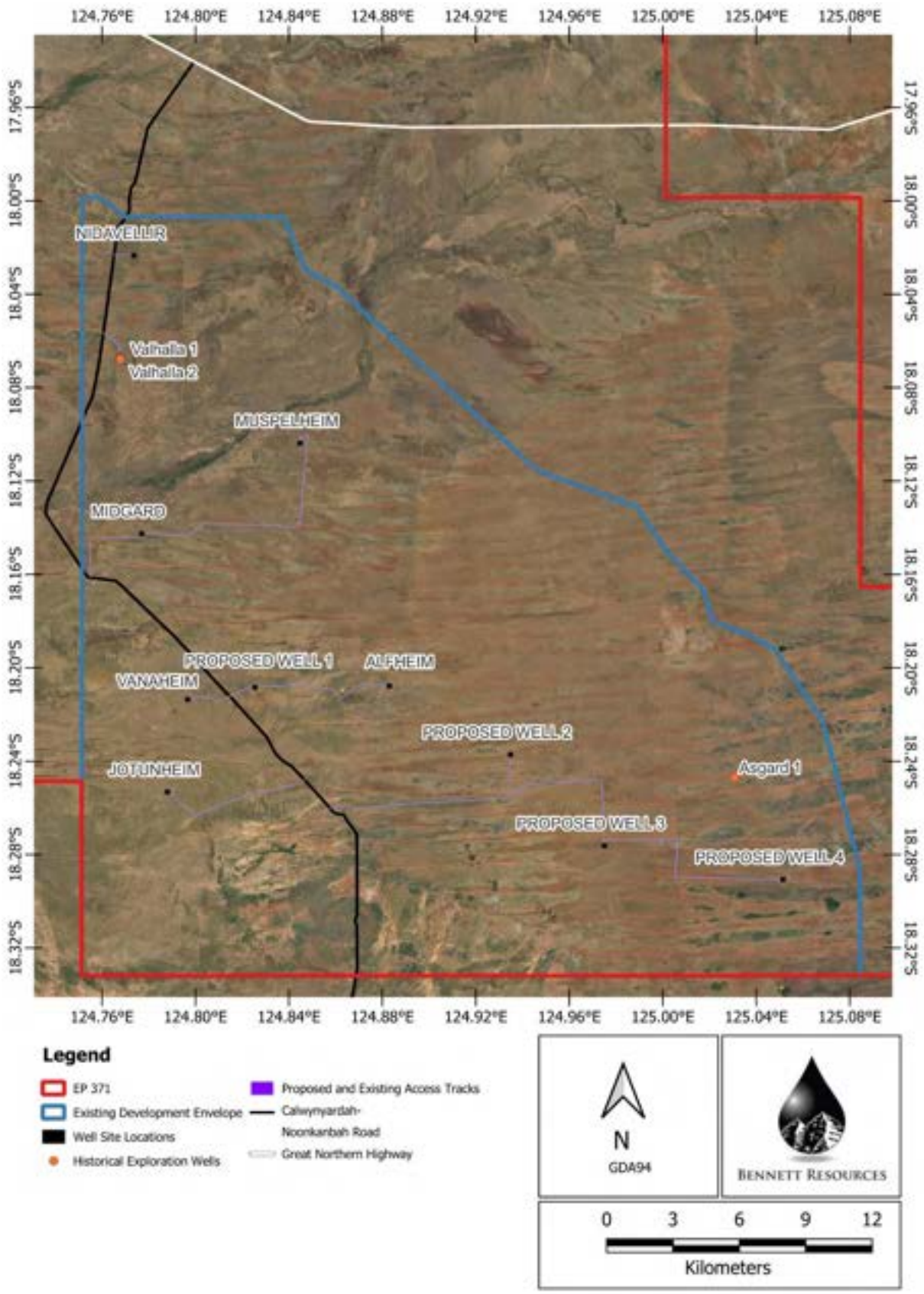

Figure 1-2: Proposed well site locations

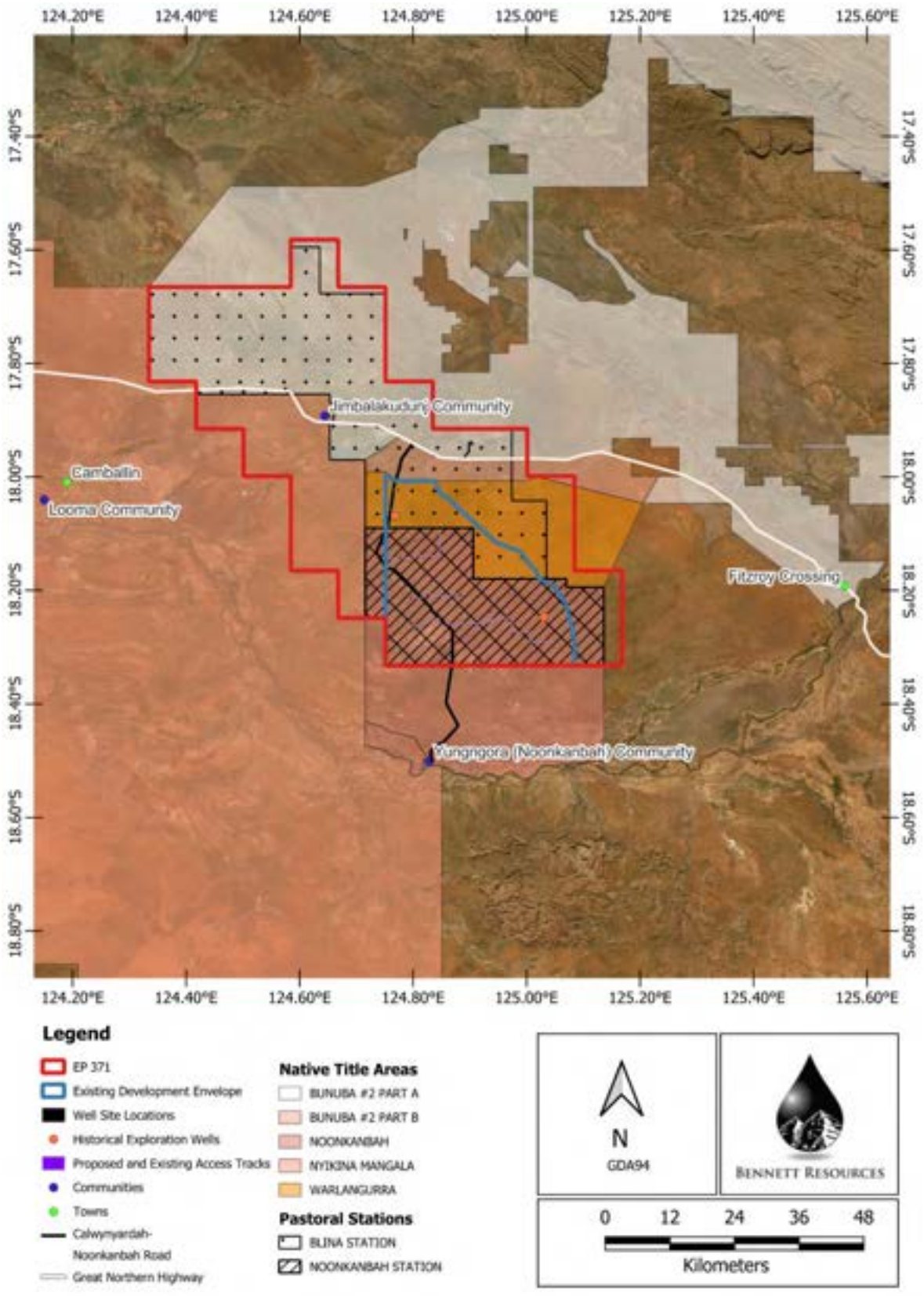

Figure 1-3: Native title areas, pastoral stations and nearest communities within EP 371

1.3 Key Environmental Factor Summary table

Table 1-2: Summary of potential impacts, proposed mitigation and proposed environmental outcomes for the Key Environmental Factors

Key Environmental Factor 1: Flora and Vegetation (For detailed information refer to Section 5.1, Page 82)	
Potential impacts	**Direct impacts:** • loss and fragmentation of native vegetation from clearing. **Indirect impacts:** • degradation or loss of vegetation ecology and biodiversity as a result of the introduction of non-indigenous species (weeds) • degradation or loss of vegetation ecology and biodiversity as a result of an unplanned fire event • degradation or loss of vegetation ecology and biodiversity as a result of dust.
Mitigation hierarchy	**Avoidance:** • demarcation of the proposed clearing area by a surveyor reduces, to the smallest possible extent, the chance of unplanned clearing outside the proposed footprint • as required by local shire regulations, BNR is required to ensure clearances between vegetation and industrial activities are created and maintained to reduce the risk of causing a fire outside the site • site preparation, construction and activities (e.g. hot work, off-road activities) (e.g. gas flaring) are prescribed activities in the Bush Fires Regulations 1954. As such, a range of management measures under the Regulations must and will be implemented. **Minimisation:** • with seeds and roots mainly conserved within the topsoil, topsoil will be removed and stockpiled into windrows following clearing, with subsoil left in place. It is a generally accepted industry standard that windrows should be no higher than two metres. The reason for this is that temperature in the centre of a windrow will get higher where the height / quantity of material increases. Because seed viability is reduced if temperatures increase, the quality / outcomes of revegetation using the topsoil and associated seedbank also reduces • in accordance with DAWE's Arrive Clean, Leave Clean guidance (Commonwealth of Australia, 2015), it is considered good industry practice to prevent the spread of weeds by ensuring that any fill used on site (e.g. gravel, limestone marl, soil, sand) has been verified to have a low weed risk. BNR will follow this industry practice • it is considered good industry practice to prevent the spread of weeds by ensuring that civil earthmoving machinery is subject to an inspection and if required a clean-down before arriving on site and before starting ground-disturbing activities, and BNR will require its operators follow this practice. **Rehabilitation:** • as required under the PGER(E)R, once drilling and HFS activities are complete, cleared areas that are not required to support the maintenance of infrastructure will be progressively rehabilitated to minimise environmental liability at the end of asset life. Topsoil is to be respread and rehabilitation sites actively monitored to ensure they meet the required completion criteria. Specifically, completion criteria will be developed to ensure that rehabilitation is conducted to enable long-term land use to continue. These completion criteria will be documented in the EP for acceptance by DEMIRS.
Residual impacts including assessment of significance	Loss and fragmentation of native vegetation from clearing • clearing of up to 105 ha

	Regional • having regard to the extent and distribution of these systems regionally, the loss of 0.054 per cent of a vegetation association is not considered to be significant at a regional scale. Local Significance • given that none of the vegetation associations mapped by Eco Logical are considered to be rare, nor do they match communities that have insufficient information available on them, BNR does not believe that the direct impact to each of the local vegetation communities, as detailed by Eco Logical , will result in a significant localised impact. Conservation Significance • BNR does not believe that the Proposal poses a risk to significant flora or vegetation values planned to be impacted within the disturbance footprint. Degradation or loss of vegetation ecology and biodiversity as a result of the introduction of non-indigenous species (weeds) • as weed and hygiene management are part of a standard suite of measures that can be effectively applied to the Proposal, BNR does not expect these indirect impacts to cause a significant environmental impact. Habitat loss or degradation as a result of an unplanned fire event • as prevention of fire events can be managed through a standard suite of measures that can be easily and effectively applied to the Development Envelope, BNR does not expect these indirect impacts to cause a significant environmental impact. Degradation or loss of vegetation ecology and biodiversity as a result of dust • BNR does not believe that dust generation from the Proposal will result in a credible impact to vegetation • because the dominant vegetation type within the Development Envelope is the same as that associated with the long-term monitoring program conducted in the Pilbara, BNR does not believe that dust deposition poses a significant impact to flora or vegetation. Impacts from dust on vegetation is also discussed in the flora and vegetation environmental factor in Section 5.1.5.4.
Proposed environmental outcomes	• no impacts to listed flora species • no significant reduction in pre-European vegetation association extent • no detrimental impacts to flora and vegetation values • no impact to the overall biological diversity and ecological integrity of flora and vegetation within the Development Envelope.
Assessment of offsets (if relevant)	No offsets required under the Residual Impact Significance Model (Figure 3 in WA Environmental Offsets Guidelines).
Key Environmental Factor 2: Terrestrial Environmental Quality (For detailed information refer to Section 5.2, Page 105)	
Potential impacts	**Direct impacts:** • no direct impacts to terrestrial environmental quality are expected to arise as a result of the Proposal. **Indirect impacts:** • erosion or scouring as a result of reduction in soil stability during civil works • contamination of land and soils from surface spills • inadequate rehabilitation arising from compaction.
Mitigation hierarchy	**Avoidance:**

- all high-pressure surface lines and equipment used (including the wells) will be pressure tested during rig-up to ensure their integrity before the HFS commences.

Minimisation:

- as per WQPN 26 (DoW, 2013), all lined storage compounds should have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowance for any evaporative water loss and the effects of any water re-use recovery system
- as per WQPN 26 (DoW, 2013), surface ponds used to contain wastewater or solids that may leach contaminants for short-term containment require synthetic membranes and need to meet specific requirements, which include:
  - all fluid containment liners should have a coefficient of permeability of less than 2×10^{10} m/s
  - a minimum thickness of 0.75 mm
  - dual liners
  - leak detection
- it is standard industry practice, which BNR will meet, for contractors to have and implement a refuelling procedure. Refuelling procedures include the requirement for refuelling in a designated area and using drip trays. BNR will ensure that, in accordance with a refuelling process, drip trays will be used for this activity
- as per Australian Standard AS 1940:2004 recommendations, BNR will ensure that:
  - secondary containment for hazardous materials, chemicals, and hydrocarbons comprise a volume that equals 110% of the largest container within the contained area or 25% of the combined tank volumes
  - tanks are double-skinned

  in accordance with ESD Items 5, 6, and 8, a summary of all chemicals that may be used as ingredients in drilling and hydraulic fracture is included in Appendix A. As per the requirements of Regulation 9 of PGER(E)R 2012, chemicals or substances must be disclosed for acceptance by DEMIRS before commencing activities where they are:
  - in, or added to, any treatment fluids to be used for drilling or hydraulic fracturing undertaken in the course of the activity
  - otherwise introduced into a well, reservoir, or subsurface formation in the course of the activity

  In addition, all chemicals to be used downhole under the Proposal must be included on the Australian Inventory of Chemical Substances (AICS) or are otherwise approved for use in Australia. The chemicals will be used solely for the activity purpose they will serve as stated under the EP. The constituents, toxicity, ecotoxicity, and bioaccumulation data of each chemical product or system will be disclosed
- Regulation 15 of PGER(E)R 2012 requires that an OSCP be developed for the Proposal and accepted by DEMIRS before conducting any petroleum activities
- as directed by the OSCP, spill kits will be made available onsite to support the first strike / immediate response actions in the event of a spill

  waste generated during the Proposal, including potential spill-contaminated soils and materials, will be separated and stored until an appropriately licensed waste contractor disposes of the waste at a licensed facility. Specifically, any controlled waste will be managed in accordance with the Environmental Protection (Controlled Waste) Regulations 2004. Employing an appropriately licensed waste contractor reduces the risk of other accidental release events given the contractor will be experienced in transfer and transport of waste
- waste will be managed in accordance with Table 2 8 to ensure suitable disposal

  as detailed in Appendix E, BNR will implement a soil sampling and monitoring program. Specifically, additional local baseline samples, as required, will be collected from the well sites once they are established (i.e. post vegetation clearing and prior to well site sheeting) and will be used to verify the baseline sampling that has already taken place. Surveillance samples will also be undertaken prior to site reinstatement in accordance with Appendix E,

	and the trigger and threshold actions implemented as detailed. Appropriate site reinstatement activities and soil handling methods will also be undertaken, in accordance with the soil monitoring program, to ensure any potential soil erosion, compaction and contamination are mitigated • BNR will manage waste in accordance with Table 2-8. **Rehabilitation:** **N/A**
Residual impacts including assessment of significance	**Erosion or scouring from a reduction in soil stability during civil works** • if soil materials on the site are well compacted after topsoil organics are removed and these hardstands are protected from excessive stormwater ingress, any erosion impacts arising from the Proposal would be localised and easily remediated, and therefore are not expected to be significant. **Contamination of land and soils from surface spills** • contamination of soils and the immediate surrounding land may occur from an unplanned surface spill event. Standard construction, petroleum storage, and petroleum use mitigation measures (Table 5-11) will be applied to this activity; therefore, the likelihood of such a spill event occurring is extremely low, and containment and recovery measures will ensure that any soil contamination would be minimised and remediated quickly and is not deemed significant. **Inadequate rehabilitation arising from compaction** • based on the vegetation associations impacted, the small quantity of vegetation affected under the Proposal is not regionally or locally significant • further, rehabilitation completion criteria will be included in the EP for submission and acceptance by DEMIRS to ensure any residual impacts are appropriately addressed.
Proposed environmental outcomes	• no significant or permanent impacts arising from contamination events • no long-term impacts to the terrestrial environment or detrimental impacts from erosion, scouring, or drainage.
Assessment of offsets (if relevant)	No offsets proposed.
Key Environmental Factor 3: Terrestrial Fauna (For detailed information refer to Section 5.3, Page 117)	
Potential impacts	**Direct impacts:** • death or displacement of native fauna species • habitat destruction • habitat fragmentation. **Indirect impacts:** • habitat degradation as a result of the introduction and/or spread of non-indigenous species (weeds) • habitat degradation as a result of an unplanned fire event.
Mitigation hierarchy	**Avoidance:** • in accordance with the Fauna Egress Matting and Ramps guidance (DMP, 2012), BNR will implement fauna exclusion and egress management measures where lined ponds / fauna traps are present to reduce likelihood of entrapment and allow egress if the initial exclusionary barriers fail • water retention ponds will be fenced with 1 m high feral ring lock mesh fencing with small-animal mesh attached to the base of the fence to help prevent ingress of small animals • during drilling activities, one section of the mud sumps will be unfenced in front of the shakers to allow the cuttings chute to be directed into the sumps

	• at least 6 months prior to clearing activities commencing, a targeted survey will be undertaken to identify any active and non-active bilby burrows throughout the Disturbance Footprint. Where evidence of species presence exists, specific bilby management measures (detailed below) will be implemented
	• in accordance with local shire regulations, firebreaks will be installed and maintained to ensure clearances between vegetation and the petroleum activities reduce the risk of causing a fire
	• under the Bush Fires Regulations 1954, site preparation, construction and activities (hot work and off-road activities) (i.e. gas flaring) are considered prescribed activities. As such, a range of management measures under the Regulations will be implemented, including the clearing of flammable material from around buildings, creating firebreaks and ensuring firefighting equipment is kept and well maintained at each well site.
	Minimisation:
	to mitigate potential impacts to bilbies during site preparation, these steps will be implemented if a bilby burrow is identified within the disturbance footprint:
	• the disturbance footprint will be scouted for new burrows (within a range of ~75 m)
	• no clearing will be undertaken within 50 m of any identified burrows
	• no clearing will be undertaken within 75 m of identified active burrows
	• vehicle speed limits will be reduced from dusk to dawn to:
	  • 20 km/h in areas where bilbies have been recorded
	  • 40km in areas where bilbies have not been recorded
	• vehicle speed limit signage will be installed along access tracks and at well sites. By reducing speed limits where limits are not set by law, the number of fauna strike incidents are expected to be reduced
	• BNR will conduct routine inspections of areas considered to be potential fauna traps. These include open excavations or well cellars, if they need to be left open. Egress paths from ponds will also be regularly inspected to ensure their useability
	• BNR will comply with the Arrive Clean, Leave Clean guidance (Commonwealth of Australia, 2015), to prevent spread of weeds by ensuring that fill for civil works (e.g. gravel, limestone marl, soil, or sand) has been verified to have a low weed risk
	Good hygiene measures will also be implemented, as prior to entering the well sites, earthmoving machinery and equipment being checked for weeds or weed-contaminated materials and cleaned if necessary
	• BNR will provide all records of introduced predatory species opportunistically observed over the course of the activity to DBCA. Where consistently high numbers are observed, and in consultation with DBCA, BNR will identify and implement measures that are considered suitable and commensurate to the nature of the activity.
	Rehabilitation:
	• in accordance with the PGER(E)R requirements, once drilling and HFS activities are complete, cleared areas that are not required to support the maintenance of infrastructure will be progressively rehabilitated to minimise environmental liability at the end of asset life. Topsoil and vegetation will be respread, and rehabilitation sites actively monitored to ensure they meet required completion criteria. Completion criteria will be documented in the EP and approved by DEMIRS.

Residual impacts including assessment of significance	**Wetlands and waterways** • as the Proposal will not result in clearing of vegetation within a wetland, creek or river, the residual impacts are not expected to be significant. **Conservation Areas**

	• as detailed in Section 5.1.3.2, the Development Envelope does not intersect any conservation areas. Consequently, the residual impacts are not expected to be significant. **High Biological diversity** • because the Proposal will not impact any fauna species or habitat that is known to have high biodiversity values, the residual impacts are not expected to be significant.
Proposed environmental outcomes	• no impact to listed fauna species' populations • no significant degradation, loss, or fragmentation of habitat surrounding the Development Envelope.
Assessment of offsets (if relevant)	No offsets required under the Residual Impact Significance Model (Figure 3 in WA Environmental Offsets Guidelines).
Key Environmental Factor 4: Inland Waters (For detailed information refer to Section 5.4, Page 132)	
Potential impacts	**Direct impacts:** • changes to groundwater levels (groundwater drawdown) associated with water extraction • contamination of surficial aquifers due to lost circulation. **Indirect impacts:** • changes to surface water flow due to the construction of well sites and access tracks • contamination of useable aquifers through unplanned fracture heights or well integrity failure (including casing failure).

Mitigation hierarchy	**Avoidance:**
	• in accordance with ESD Item 13, an early warning system for detecting geomechanical events has been developed and will be implemented for the Proposal. The detection system is described in Appendix B. and includes monitoring for one-month pre and post any HFS activities
	• the wells are not located within 2,000 m of a PDWSA (Section 5.4.3.7)
	• as is good industry practice (in the absence of a state Code of Practice), BNR will ensure that HFS will not occur in formations that have <600 m vertical separation to the nearest useable aquifer. This will be checked and confirmed once each well has been constructed, along with a geotechnical risk analysis
	• in accordance with the Guidelines for the protection of surface and groundwater resources during exploration and appraisal drilling (DMPR, 2002), the potential for contaminating groundwater resources will be managed by installing casing that is secured/sealed by a sealing material such as cement
	• in accordance with ESD Item 14 and Regulation 10 of the PGER (Resource Management and Administration) Regulations 2015, every new well is required to have a WMP in place to ensure the well is designed and managed in accordance with sound engineering principles and industry good practice, including identification of risks. The WMP specifically describes and addresses well integrity risks and includes the requirements for the operator to manage these accordingly. Specifically, the WMP will address casing integrity management that will then be assessed and accepted by DEMIRS before HFS commences. Therefore, well management plans will be developed and approved prior to each well being constructed
	A summary of well integrity management is provided in Section 1.4.1.2.
	• as required by the ESD Item 4, BNR has developed a GWMP (Appendix M) that documents the groundwater monitoring requirements along with management actions associated with trigger and threshold criteria that must be implemented
	  • BNR believes that with the triggers detailed in the GWMP, groundwater sensitivities (such as subterranean fauna) will be protected
	  • BNR will ensure the location of all monitoring bores is completed in consultation with DWER and DEMIRS

- BNR will complete all groundwater monitoring (including local baseline sampling) in accordance with the Part IV Groundwater Management Plan.

Minimisation:

- as per WQPN 26 (DoW, 2013), all lined storage compounds will have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowing for any evaporative water loss and the effects of any water re-use recovery system. All water storage ponds will be designed to meet these requirements
- installation and drilling of all water bores (including abstraction bores) will be hydro stratigraphically logged in detail and geophysical interpretation of groundwater quality collected, for the interval where fresh aquifers are known to be present (including through the Grant formation)

  BNR will conduct validation water samples (along with QA/QC samples of any fluids or water used for the bore installation process) at a point of discharge from the circulation system to understand if cross contamination may be occurring as evidenced by fluid constituent presence associated with bore installation. This may involve the use of tracer dyes, but these specifics are subject to local conditions, aquifer depths and will be directed by a hydrogeologist during bore installation
- BNR will hydrostratigraphically log the petroleum well during drilling activities and collect a geophysical interpretation of groundwater aquifers
- in accordance with WQPN 26 (DoW, 2013), surface ponds used for short-term containment of wastewater or solids that may leach contaminants, require synthetic membranes and need to meet specific requirements, including:
  - all fluid containment liners should have a coefficient of permeability of less than 2×10^{10} m/s
  - a minimum thickness of 0.75 mm
  - dual liners
  - leak detection

  All surface ponds will be constructed to meet these requirements
- in accordance with ESD Items 5, 6, 7, 8, and 9, a chemical inventory has been developed for the Proposal (Appendix A)
- BNR plans to use a low-toxicity mud system for the top-hole section that, if lost to the environment, is not expected to result in environmental impacts
- as per Regulation 15 of the PGER(E)R 2012, BNR will monitor, and record volumes of fluids not recovered during circulation.

Water meters will be installed as required on all groundwater abstraction wells

Monitor:

- as required by ESD Item 4, all water wastes and emissions, including formation water produced during well testing, resulting from the Proposal will be recorded and monitored
- a site water audit on completion of HFS at each well site will be undertaken, accounting for water produced, evaporated and disposed, to detect significant leakage of fluids and determine whether remedial action to track any contaminants is warranted
- as required by ESD Item 4, Ecotoxicology testing of produced formation waters at each wellsite will be conducted by an independent NATA endorsed laboratory, either through the sea urchin fertilization test using Heliocidaris tuberculate or other appropriate methodology. Reporting will be done in accordance with annual compliance reporting to DMAs.

Rehabilitation:

N/A

Residual impacts including assessment of significance	**Changes to groundwater levels (groundwater drawdown) associated with water extraction** • it is extremely unlikely that due to the migration timeframe and the nature of the low-toxicity mud system used that any change to groundwater quality would be observed, noting that the closest groundwater user is at least 18 km from the project area. **Changes to surface water flow due to the construction of well sites and access tracks** • with the proposed mitigations in place, changes to surface water flow is not expected to result in regional impacts, and any localised impacts are not expected to be significant. **Potential contamination of aquifers through unplanned fracture heights** • BNR does not believe that contamination of useable aquifers through unplanned fracture heights is a credible risk for the Proposal. **Potential contamination of surficial aquifers from an accidental release at the surface of drilling fluids, HFS chemicals, liquid hydrocarbons, or produced formation water** • if standard management measures are implemented, BNR does not expect these events to occur, but if they do, any indirect impacts are not expected to cause a significant environmental impact. **Potential risk to site activities and infrastructure due to extreme rainfall events** • the GWMP will be implemented to demonstrate that residual impacts are not greater than predicted, which are not deemed to be significant after analysis of local rainfall and flooding events.
Proposed environmental outcomes	No impacts to hydrological regimes or groundwater quality, demonstrated by: • no significant drawdown of the aquifer following completion of the Proposal that is considered outside seasonal fluctuations • no change to groundwater quality attributable to the Proposal.
Assessment of offsets (if relevant)	No offsets proposed.
Key Environmental Factor 5: Social Surroundings (For detailed information refer to Section 5.5, Page 171)	
Potential impacts	**Direct impacts:** • increased dust emissions • increased noise and vibration emissions • increased traffic movement • disruption to existing land users • social and economic benefits • impacts to workers' health. **Indirect impacts:** • potential impacts to heritage sites • amenity and aesthetics • local social impact arising from mental health and wellbeing, due to impacts from changes to the physical or biological environment.

Mitigation hierarchy	**Avoidance:** • demarcation of the proposed clearing area by a surveyor reduces—to the smallest possible extent—the chance of unplanned clearing and potential damage to heritage sites outside the proposed footprint • no specific upgrades to the Calwynyardah–Noonkanbah Road are required for the activities. However, for the safety of other road users, BNR will monitor the condition of the gravel road throughout the Proposal's activities. BNR will liaise directly with SDWK and YAI regarding the frequency of road maintenance. **Minimisation:** • BNR will record and investigate any complaints over the course of the activity and record these in the Proposal's action tracking system. This includes any complaints provided by the public regarding impacts to amenity and aesthetics • BNR will conduct an amenity and aesthetics assessment during site activities. This will comprise a visual assessment of the activity within the landscape to confirm that visual impacts, noise emissions and any other emissions do not reduce amenity at key points along the Calwynyardah–Noonkanbah Road • implementing dust management techniques, such as water carts, ensures that dust generation can be prevented and reduced if necessary • consultation with relevant Traditional Owner groups will help determine the risk of heritage material being present on site. Consultation with other stakeholders will ensure that issues related to the Proposal are identified and addressed • Traditional Owners will be invited to partake in the Proposal as heritage monitors during ground-disturbing activities. Heritage monitors will be onsite during disturbance of the topsoil to ensure that activities cease if heritage material is uncovered, and discovery of the material is immediately reported to the Noonkanbah and Warlangurru Traditional Owners to verify if it is a heritage artefact subject to protection under the *Aboriginal Heritage Act 1972* (WA) • BNR has a comprehensive induction process that considers environmental impacts and risks • as required by ESD Item 61, BNR will provide cultural awareness and orientation to staff involved in ground-disturbance activities. BNR will conduct these in accordance with the Yungngora ILUA that specifically requires induction material to be developed in consultation with the Traditional Owners. Under the agreement, Yungngora has the right to select community members to deliver the induction package in accordance with the terms of the agreement • to reduce emissions from traffic, BNR will monitor vehicles and maintain these, as required, throughout the Proposal • after completing the Proposal activities, and as required under the PGER Act, BNR will submit and implement a decommissioning EP. **Rehabilitation:** • in accordance with the PGER(E)R requirements, once drilling and HFS activities are complete, cleared areas that are not required to support the maintenance of infrastructure will be progressively rehabilitated to minimise rehabilitation legacy at the end of asset life. Topsoil and vegetation will be respread, and rehabilitation sites actively monitored to ensure they meet required completion criteria. Completion criteria will be documented in the EP.
Residual impacts including assessment of significance	**Natural Heritage** • a search of the WA Government's InHerit database did not identify any registered natural heritage sites (statutory heritage listings) within or adjacent to the Development Envelope • although located within a single heritage site – impacts have been avoided through realignment. Even though impacts have been avoided, s16 approval under the AH Act will be required • the Proposal is not located within any of the iconic natural heritage places • no world heritage sites or Commonwealth heritage sites occur within EP 371.

	Impacts assessed • (increased dust) Based on the assessment criteria, the Proposal is considered to be classified under Site Classification 1; i.e. considered a negligible risk with no specific provisions or contingency arrangements required (DEC, 2011) • (increased noise and vibrations) In accordance with the definitions provided in the Environmental Protection (Noise) Regulations 1997, no noise sensitive premises, commercial or industrial premises are located within the Development Envelope. With no fixed sensitive receptors nearby that can be exposed to the Proposal's increased noise levels, noise emissions from the Proposal are not expected to result in a significant impact to social surroundings • (disruption to existing land users) The Traditional Owners are made aware of all BNR presence and activities on site, and discussions are ongoing regarding the participation and employment of community members in the Proposal's activities. The community supports current and future work opportunities on EP 371 • (increased Traffic) Vehicle movements associated with the Proposal are unlikely to result in impacts to traffic on local dirt tracks within the Development Envelope given that these (with the exception of one currently existing access track) are planned to be constructed specifically for the Proposal and only to access the proposed well sites • (impact to workers health) BNR has not conducted a detailed assessment of impacts to worker health as this will be managed under the Work Health and Safety Act 2020 (WA) • (potential impacts to heritage sites) With the current understanding of local heritage, the Proposal is not expected to have a significant impact on the cultural heritage of the region • (potential impacts to heritage sites) Apart from additional vehicles and dust in remote places, it was felt by the Yungngora Aboriginal Corporation and Warlangurru Aboriginal Corporation representatives that the impacts on their aesthetic, cultural, economic and social surroundings would be minimal • (amenity and Aesthetics) the short duration of the Proposal activities and the nature of the landscape, impacts to amenity (if any) are expected to be limited with no long-term impacts expected.
Proposed environmental outcomes	• no impacts to heritage sites or artefacts • no significant disruption to existing land users • direct and indirect economic benefits to the local communities of the SDWK.
Assessment of offsets (if relevant)	No offsets proposed
Key Environmental Factor 6: Air Quality (For detailed information refer to Section 5.6, Page 198)	
Potential impacts	**Direct impacts:** N/A **Indirect impacts:** • reduction in air quality causing impacts to sensitive social receptors • increased dust generation resulting in deposition impacts to flora and vegetation.
Mitigation hierarchy	**Avoidance:** • BNR is considering using green completions, which allow gas produced during well completions to be separated for offtake to a sales gas pipeline. Given the distance of the well sites to existing gas markets, the emissions associated with transport offsite will also need to be considered

	Because of the complexities of negotiating an offtake agreement with a gas supplier, the green completions option will be considered closer to the time of the activity.
	Minimisation:
	• throughout the planning phase, BNR has conducted baseline air quality monitoring in accordance with EPA guidance and in consultation with DWER. Although the initial program formed the basis of this assessment, BNR plans to continue with a range of both baseline and surveillance monitoring programs to verify the Proposal activities can be undertaken in a way that has no significant impacts to the environment. A summary of the proposed air quality monitoring program to be undertaken for the Proposal is included in Appendix E. Specifically, the air quality monitoring planned for the Proposal includes:
	  • continuing ambient air quality monitoring
	  • verifying that ambient air quality levels near the communities (~2.5 to 5 km away) remain unaffected by the activity
	• BNR will reduce cold venting during well test flaring to ALARP, which will significantly reduce methane emissions associated with this activity. Cold venting results in the release of methane, carbon dioxide, VOCs, sulphur compounds and gas impurities to the atmosphere, whereas flaring causes these gases to oxidise and form carbon dioxide, which has a global warming potential 25 times lower than methane
	• BNR will implement dust management techniques, such as dust suppression, to ensure that dust generation is minimised
	• BNR will record and investigate any atmospheric emission complaints over the course of the activity and record these in the Proposal's action tracking system.
	Rehabilitation:
	N/A

Residual impacts including assessment of significance	**Reduction in air quality causing impacts to sensitive social receptors** • based on these distances and the surrounding rural land use, air emissions arising from using vehicles, heavy equipment and generators are not considered to represent a significant or long-lasting impact to air quality, human health, or aesthetics during site activities. **Increased dust generation resulting in deposition impacts to flora and vegetation** • because the dominant vegetation type within the Development Envelope is the same as that associated with the long-term monitoring program conducted in the Pilbara, BNR does not believe that dust deposition poses a significant impact to flora or vegetation. Impacts from dust on vegetation is also discussed in the flora and vegetation environmental factor in Section 5.1.5.4.
Proposed environmental outcomes	• no reduction in air quality that results in impacts to sensitive.
Assessment of offsets (if relevant)	No offsets proposed
Key Environmental Factor 7: Greenhouse Gas (For detailed information refer to Section 5.7, Page 207)	
Potential impacts	**Impacts:** • contribution to GHG emissions.
Mitigation hierarchy	**Avoidance/Reduce:** • as required by the ESD Item 78, BNR has developed a GHG EMP that documents the mitigation and management measures associated with the Proposal. A summary of the proposed GHG monitoring to be undertaken in accordance with the GHG EMP is provided in Appendix R • throughout the planning phase, BNR has conducted baseline GHG emissions monitoring (limited to methane) in accordance with EPA guidance and in consultation with DWER. Although the initial program formed the basis of this assessment, BNR plan to continue its methane monitoring program with

	baseline and surveillance monitoring to verify the impacts of the Proposal's activities. Monitoring will continue until a trend *back to baseline levels has been demonstrated **and** at least two consecutive results reflect no significant deviation from ambient (baseline) samples* (Appendix E). **Minimisation:** • BNR will maintain emissions records to enable GHG emissions reporting as required under the NGER Act. **Rehabilitation:** N/A
Residual impacts including assessment of significance	**Based on the predicted outcome for the Proposal, BNR does not believe that the Proposal will result in a significant contribution to GHG emissions** • no Scope 2 emissions are expected • no Scope 3 emissions are expected • the GHG EMP will be implemented to demonstrate that residual GHG impacts from the Proposal (Scope 1 emissions) are not greater than predicted.
Proposed environmental outcomes	• GHG emissions minimised to ALARP to mitigate the risk of environmental harm associated with climate change.
Assessment of offsets (if relevant)	BNR acknowledges that carbon offsets may be necessary to meet the environmental outcomes defined within this GHG EMP. Where and when required, BNR will acquire carbon offsets that meet the contemporary Australian acceptability standards (e.g., they should meet offset integrity principles and be based on clear, enforceable, and accountable methods.
Key Environmental Factor 8: Human Health (For detailed information refer to Section 5.85.1, Page 212)	
Potential impacts	**Impacts:** • industrial processes that result in the build-up and release of radioactive substances or emissions.

Mitigation hierarchy	**Minimisation:**
	• as detailed in Appendix E, BNR will sample produced formation water (from within water retention ponds) and drill cuttings (from the mud sumps) for CoPC, including NORMs
	• as per WQPN 26 (DoW, 2013), all lined storage compounds should have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowing for any evaporative water loss and the effects of any water re-use recovery system
	• in accordance with WQPN 26 (DoW, 2013), surface ponds used for short-term containment of wastewater or solids that may leach contaminants, require synthetic membranes and need to meet specific requirements, which include:
	  • all fluid containment liners should have a coefficient of permeability of less than 2×10^{10} m/s
	  • a minimum thickness of 0.75 mm
	  • dual liners
	  • leak detection
	• all produced formation water will be managed in accordance with the principles detailed in Table 2-8.
	Rehabilitation:
	N/A

Residual impacts including assessment of significance	**Industrial processes that result in the build-up and release of radioactive substances or emissions** • BNR does not expect any NORM-contaminated material to be released to the environment that causes exposure to humans and risks human health. If an accidental release from the water retention pond or drilling sump did occur, impacts to human health are not expected because the NORM concentrations from the Laurel Formation have proven to be low and below the levels set out by industry guidelines.
Proposed environmental outcomes	• no impacts to human health by industrial processes that result in the build-up and release of radioactive substances or emissions.
Assessment of offsets (if relevant)	No offsets proposed
Key Environmental Factor 9: Subterranean Fauna (For detailed information refer to Section 5.9, Page 215)	
Potential impacts	**Direct impacts:** • groundwater drawdown of surficial aquifers associated with water extraction. **Indirect impacts:** • contamination of surficial aquifers from an accidental release (of drilling fluids, HFS chemicals, liquid hydrocarbons, or produced formation water) at the surface.
Mitigation hierarchy	**Avoidance:** • in accordance with the Guidelines for the protection of surface and groundwater resources during exploration and appraisal drilling (DMPR, 2002), the potential for contaminating groundwater resources will be managed by installing casing that is secured/sealed by a sealing material such as cement. **Minimisation:** • as required by the ESD Item 4, BNR has developed a GWMP (Appendix M) that documents the groundwater monitoring requirements along with management actions associated with trigger and threshold criteria that must be implemented BNR believes that with the triggers detailed in the GWMP, groundwater sensitivities (such as subterranean fauna) will be protected As per Australian Standard AS 1940:2004 recommendations, BNR will ensure that secondary containment for hazardous materials, chemicals, and hydrocarbons comprise volumes that equal 110% of the largest container within the contained area or 25% of the combined tank volumes, and that tanks are double-skinned • as per WQPN 26 (DoW, 2013), all lined storage compounds will have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowing for any evaporative water loss and the effects of any water re-use recovery system. All water storage ponds will be designed to meet these requirements • installation and drilling of all water bores (including abstraction bores) will be hydro stratigraphically logged in detail and geophysical interpretation of groundwater quality collected, for the interval where fresh aquifers are known to be present (including through the Grant formation) • annulus seals and gravel packs will be used, where necessary, to isolate the zone being monitored and prevent potential cross contamination via the bore casing as required by the Minimum Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee, 2011) required to be followed as detailed in the Groundwater monitoring in the onshore petroleum and geothermal industry guideline (DMP & DoW, 2016). BNR will conduct validation water samples (along with QA/QC samples of any fluids including water used for the bore installation process) at a point of discharge from the circulation system to understand if cross contamination may be occurring as evidenced by fluid constituent presence associated with bore installation. This may involve the use of tracer dyes, but these specifics are subject to local conditions, aquifer depths and will be directed by a hydrogeologist during bore installation • in accordance with WQPN 26 (DoW, 2013), surface ponds used for short-term containment of wastewater or solids that may leach contaminants

	• BNR plans to use a low-toxicity mud system for the top-hole section that, if lost to the environment, is not expected to result in environmental impacts. **Rehabilitation:** N/A
Residual impacts including assessment of significance	**High biological diversity / habitat for fauna** • given the impacts from these activities are limited, any indirect impacts to subterranean fauna would not be expected. Consequently, the residual impacts from this Proposal are not expected to be significant.

Proposed environmental outcomes	• no impacts to subterranean fauna demonstrated by:
	  • no short-term significant drawdown of the aquifer
	  • no change to groundwater quality.

Assessment of offsets (if relevant)	No offsets proposed

1.4 Legislative Context

1.4.1 Environmental impact assessment process

The Proposal was referred to the EPA under Section 38 of the EP Act on 24 December 2020. On 3 February 2021, the EPA determined that the Proposal should be assessed under section 39a of the EP Act at the level of assessment of Public Environmental Review (PER).

On 4 August 2021, the EPA issued the Environmental Scoping Document (ESD) for public review, which contained the requirements that should be included in this ERD. This ERD has been prepared to meet the requirements of the final ESD, which was issued by the EPA on 8 November 2021. In preparing this ERD, BNR completed engagements and studies to address the key environmental factors determined by the EPA, including:

- flora and vegetation
- terrestrial environmental quality
- terrestrial fauna
- inland waters
- social surroundings
- air quality
- greenhouse gas emissions
- human health
- subterranean fauna.

Once the EPA is satisfied that this ERD meets the requirements of the ESD, the EPA will approve the release of the ERD for public review for an eight-week period. Following this public review process, the EPA will provide BNR with a copy of all submissions received, which BNR will address in a Response to Submissions document. This will be prepared to the satisfaction of the EPA and will constitute part of the assessment documentation for the Proposal.

The EPA will then prepare its report and recommendations and submit this to the WA Minister for Environment for consideration as part of the Minister's decision process on Proposal approval or otherwise.

This ERD content, format and environmental assessment have considered the following EPA guidance:

- Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures (GoWA 2021) (Administrative Procedures)
- Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2021a) (Procedures Manual)
- Statement of Environmental Principles, Factors and Objectives and Aims of EIA (EPA 2021c)]
- Instructions – How to identify the content of a Proposal (EPA 2021c)
- Instructions – How to prepare an Environmental Review Document (EPA 2021d)
- Instructions – Environmental outcomes and outcomes-based conditions (EPA 2021e)
- Instructions for preparing data packages for the Index of Biodiversity Surveys for Assessments (IBSA) (EPA 2020a)
- Instructions on how to prepare EP Act Part IV Environmental Management Plans (EMPs) (EPA 2020b).

In addition to the required approvals under Part IV of the EP Act, Table 1-3 and further sections below summarise other key environmental and regulatory approvals required to be in place for the Proposal.

Table 1-3: Other statutory decision-making processes which can mitigate potential impacts on the environment

Environmental Factor	Environmental impact	How is the impact regulated by other decision-making processes?	Limit(s) of the decision-making process(es) to regulate the impact e.g. time limits, excluded operations	Likely environmental outcome of decision-making process(es) and consistency with EPA objective	Conditions, enforcement, and review process required by decision-making process(es)	Stakeholder engagement in decision-making process(es)
Inland Waters	Potential impact to groundwater from drilling and well testing	DEMIRS approvals required: • Environment Plan • Well Management Plan (individual for each well), as covered in *Petroleum and Geothermal Energy Resources (PGER) Act 1967* (WA) • PGER (Environment) Regulations 2012 (PGER(E)R)	DEMIRS oversees all drilling activities, with daily reporting required, ensuring immediate response in the event of an environmental impact	Daily reporting ensures any impacts can be immediately addressed, protecting environmental values of groundwater	Environment Plans and Well Management Plans include actions and commitments, overseen and regulated by DEMIRS	Ongoing consultation with TOs and pastoral station owners, as well as DEMIRS
Terrestrial Environmental Quality	Potential surface spill	DEMIRS approvals required: • Oil Spill Contingency Plan (OSCP), as covered in Petroleum and Geothermal Energy Resources (PGER) Act 1967 (WA) • Environment Plan - PGER (Environment) Regulations 2012 (PGER(E)R)	DEMIRS oversees all drilling activities, with daily reporting required, ensuring immediate response in the event of an environmental impact	Daily reporting ensures any impacts can be immediately addressed, protecting environmental values of the surface and groundwater	All spills must be immediately reported to DEMIRS and actions as approved in the OSCP undertaken to mitigate any potential impacts.	Ongoing consultation with TOs and pastoral station owners, as well as DEMIRS
Flora and Vegetation	Potential impact to vulnerable/endangered flora or fauna	The project is being referred under the *Environment Protection and Biodiversity*	Targeted surveys of all species listed by DCCEEW will be undertaken	Environmental values will be protected as BNR has committed to ensuring	Commitments made will be monitored by Commonwealth and State Government agencies	Ongoing consultation with TOs and pastoral station owners, as

Environmental Factor	Environmental impact	How is the impact regulated by other decision-making processes?	Limit(s) of the decision-making process(es) to regulate the impact e.g. time limits, excluded operations	Likely environmental outcome of decision-making process(es) and consistency with EPA objective	Conditions, enforcement, and review process required by decision-making process(es)	Stakeholder engagement in decision-making process(es)
Terrestrial Fauna		*Conservation Act 1999*, regulated by DCCEEW		buffers to exclude areas with listed active species		well as DWER and DCCEEW
Social Surroundings	Potential impacts to cultural heritage	Under the National Native Title Tribunal, and regulated through *Native Title Act 1993* (Commonwealth) Native Title (Indigenous Land Use Agreements) Regulations 1999 Native Title (Prescribed Body Corporate) Regulations 1999	Native title agreements via an Indigenous Land Use Agreement and a Land Access and Use Agreement have been put into place	Environmental and cultural heritage values protected through ongoing engagement with TOs at all stages of the operation, in particular when clearing land	Ongoing monitoring by TOs, consistent with the Land Access and Use Agreements and other agreement mechanisms	Ongoing consultation with TOs and pastoral station owners, as well as the National Native Title Tribunal
Social Surroundings	Potential impacts to cultural heritage sites	Aboriginal Heritage Act 1972 S16 authorisation required	No Aboriginal Heritage sites will be impacted; however a single site intersects the Disturbance Footprint	Environmental and cultural heritage values protected through ongoing engagement with TOs and already completed realignment of the disturbance footprint.	s 16 authorisation to enter, excavate, examine or remove anything on an Aboriginal site will be required	Consultation with TOs has been undertaken and the disturbance footprint realigned to avoid impacts to the site. Although not yet engaged – DPLH will be engaged following completion of the impact assessment process and a s16 application lodged
Inland Waters	Potential impacts to groundwater levels	Regulation by DWER through 26D Licence to construct a well/bore 5C Licence to take water under the *Rights in Water and*	Abstraction rates are regulated and monitoring bores provide additional checks for regulators	Groundwater values protected through licensed abstraction limits and ongoing monitoring	Groundwater values protected through licensed abstraction limits and ongoing monitoring	Prior to the provision of a groundwater licence to abstract water, and due to the volume of water, licence

Environmental Factor	Environmental impact	How is the impact regulated by other decision-making processes?	Limit(s) of the decision-making process(es) to regulate the impact e.g. time limits, excluded operations	Likely environmental outcome of decision-making process(es) and consistency with EPA objective	Conditions, enforcement, and review process required by decision-making process(es)	Stakeholder engagement in decision-making process(es)
		Irrigation Act 1914 (WA) (RIWI Act)				applications will be subject to public comment
Terrestrial Environmental Quality	Potential impact from accommodation and associated infrastructure	Regulated by the Shire of Derby – West Kimberley through development/planning approvals, building permits and a permit to install an apparatus for treating sewage, through the *Planning and Development Act 2005*, the *Building Act 2011*, *Public Health Act 2016*, *Health (Miscellaneous Provisions) Act 1911* and the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974	All operations are regulated by the Department of Health and/or local government with no exclusions	Environmental values protected through extensive local government regulation	BNR must comply with all regulations	Ongoing consultation with TOs and pastoral station owners, as well as the Department of Health and local government

1.4.2 Environmental Protection and Biodiversity Act 1999

Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Austraila, 2013) - provides basis for consideration of what constitutes a significant impact to a matter of environmental significance.

Matters of national environmental significance known or likely to occur within or adjacent to the Development Envelope include:

- National Heritage Place (the West Kimberley National Heritage Area (WKNHA))
- Nationally threatened species
- Migratory species
- Water resource in relation to large coal mining development or coal seam gas.

On 15 December 2023, the EPBC Act Water Trigger was amended to include consideration of likely significant impacts on water resources in relation to all types of unconventional gas, for example, shale and tight gas related developments.

The Proposed Action involves HFS, whereby groundwater is mixed with sand and chemical additives prior to the pumping of this mix down each well, to create hairline fractures in the target formation and allowing gas to flow to the wellbore. Thus, this trigger is now of relevance to the Proposed Action. BNR continues to consult with DCCEEW during the preparation (and submission of) referral documentation.

1.4.3 Petroleum and Geothermal Energy Resources Act 1967

The WA Department of Mines, Energy, Industry Regulation and Safety (DEMIRS) is responsible for administering various acts including the *Petroleum and Geothermal Energy Resources Act 1967* (PGER Act). Under this Act, various subsidiary legislation has been enacted, which requires BNR to seek additional approvals from DEMIRS before implementing the Proposal. This includes Safety Management Systems and Emergency Response Plan, covered by the PGER (Management of Safety Regulations) 2010 which, while not having a direct relation to potential impacts on the environment, nevertheless assist in mitigating potential impacts through regulating the safety of the site and personnel.

1.4.3.1 Petroleum and Geothermal Energy Resources (Environment) Regulations 2012

Under the Petroleum and Geothermal Energy Resources (Environment) Regulations (PGER(E)R) 2012, an Environment Plan (EP) must be accepted by DEMIRS for petroleum-related activities, before such activities can commence. The EP must evaluate all impacts and risks that are associated with an activity, and demonstrate that, with the management measures identified, the impacts and risks are reduced to levels that are ‘As Low As Reasonably Practicable’ (ALARP). Further to this, the EP must demonstrate that the environmental impacts and risks are acceptable. Included as part of an EP is the requirement to submit an Oil Spill Contingency Plan (OSCP) for approval. An EP cannot be accepted without an approved OSCP. The OSCP covers all spill scenarios associated with the activity.

1.4.3.2 Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2015

In accordance with ESD Item 14, BNR will manage its wells throughout their lifecycle under a well integrity management system, which includes meeting or exceeding all requirements set forth in the Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2015, as required by DEMIRS. Under the Regulations, a Well Management Plan (WMP) that describes the history of all well activities relating to the planning, design, construction, integrity, and management of a well throughout its life cycle must be approved by DEMIRS. Among other requirements, the WMP must explain the philosophy of, and criteria for, the design, construction, activities and management of the well. The WMP covers the drilling and HFS program and identifies the risks. The WMP adopts a risk-based approach for petroleum exploration and ensures appraisal activities are undertaken in accordance with good oilfield practice to minimise the risk of aquifer contamination.

At a minimum, the WMP will:

- identify and assess all risks associated with the well activity and their resulting impacts

- establish specific environmental performance objectives and standards against identified risks (including measurement criteria to assess performance of those standards)
- detail mitigation measures for identified risks, including those where the likelihood of occurrence is low.

Specific design requirements that are documented in the WMP and managed under these regulations include:

- ensuring the casing grade is selected in accordance with American Petroleum Institute (API) grades
- designing the well with a minimum required casing string
- undertaking integrity tests throughout the drilling process including:
  - casing pressure test
  - formation pressure integrity test
  - cement bond logs
- reporting arrangements to DEMIRS, including the results of well logging and pressure tests undertaken during well construction and prior to HFS activities. Reporting of integrity tests will also occur during and after HFS
- highlighting casing failure / well integrity issues as a potential risk, while recognising that all wells will be constructed to ensure there are two barriers present at all times during drilling activities. Should a well barrier be compromised, the well activity would be suspended, and integrity measures, as documented in the DEMIRS-accepted Well Management Plan, implemented to ensure risk of contamination is ALARP.

In addition to WMPs and seeking approval on the well design construction methodology, BNR will ensure that well integrity is assessed by an independent and certified well examiner approved by DEMIRS. BNR will follow the relevant Australian and international standards related to well integrity including ISO 165301 and NORSOK D-010. Further information on BNR's well integrity management system is detailed in Section 2.5.

1.4.4 Rights in Water and Irrigation Act 1914

Any extraction of groundwater within a proclaimed groundwater area is subject to a licence issued by the WA Department of Water and Environmental Regulation (DWER) under the *Rights in Water and Irrigation Act 1914* (RIWI Act). A cumulative assessment of all extraction in the groundwater area must be completed to ensure allocation limits are not exceeded; this assessment is done independent of the applicant such that local and regional cumulative impacts are considered.

Under a RIWI Act groundwater licence, volumes extracted must be monitored and reported to DWER annually to confirm compliance with the licence and confirm that extraction above the licence allocation does not occur.

1.4.5 Aboriginal Heritage Act 1972

Aboriginal Heritage Act 1972 is the regime for the protection and preservation of Aboriginal cultural heritage in Western Australia. BNR is required to ensure that any ground disturbance is undertaken in accordance with the WA *Aboriginal Heritage Act 1972*. Unless acting with the authorisation of the Registrar under section 16 or the consent of the Minister under section 18, it is an offence under the AH Act for any person to excavate, destroy, damage, conceal or in any way alter any Aboriginal site.

While the bulk of the ERD was prepared in 2021, BNR has noted developments with the Aboriginal Heritage Act (including the enactment and subsequent repeal of the *Aboriginal Cultural Heritage Act* 2021) to ensure consistency with the Proposal and this environmental factor. On 15 November 2023 the *Aboriginal Cultural Heritage Act 2021* (WA) was repealed, meaning that the previous *Aboriginal Heritage Act 1972* (WA) was restored, with amendments.

1.4.6 Review of the HFS scientific inquiry

On 5 September 2017, the WA Government announced an independent scientific panel inquiry to assess and report on the potential impacts arising from implementing HFS on the onshore environment of WA. This inquiry was established under Section 25 of the EP Act. Following input from stakeholders, a final report was submitted to the WA Government in September 2018 (Independent Scientific Panel Inquiry, 2018). Based on the evidence presented and the international standards for designing, constructing, and operating an individual petroleum well incorporating HFS, the inquiry found that HFS activities generally pose low-level and limited risks to the environment and people, if properly carried out and located. To further reduce these risks, respond to community concerns, and regulate HFS and its activities, the report identified 44 recommendations aimed at government departments, regulators, and HFS proponents.

BNR has reviewed all recommendations arising from this HFS inquiry and has used relevant recommendations to inform mitigation and monitoring requirements of the Proposal.

1.4.7 Western Australian code of practice

An enforceable Code of Practice for HFS was a key recommendation of the Independent Scientific Inquiry Report (Independent Scientific Panel Inquiry, 2018). The Code of Practice will include necessary prescriptive requirements and standards across the entire development lifecycle of HFS programs and ensure that all activities comply with an acceptable and high standard across the industry. Therefore, the HFS WA Code of Practice will close out the prescriptive and technical recommendations published in the Independent Scientific Inquiry's final report.

At the time of writing this document, the HFS WA Code of Practice was not yet complete. In the absence of a WA Code of Practice, BNR understands (from engagement with the EPA) that the prescriptive requirements of the Code of Practice have been included in the ESD.

BNR will comply with the WA Code of Practice once it is finalised.

2 Proposal content

2.1 Background

The Proposal was referred to the EPA under section 38 of the WA EP Act on 24 December 2020. Section 1.4.1 details the timeline and stages of the environmental impact assessment process. This ERD has been prepared to meet the requirements of the Final ESD, which was issued on 8 November 2021.

Modifications to the Proposal since the Referral include modifying and optimising the proposed Muspelheim site, camp and track, the Alfheim and the Proposed Well Site 4 tracks to avoid damp land / marshland and creek lines, to prevent impacts to priority listed flora species and to avoid a heritage site.

Note that the Development Envelope is larger to encompass horizontal drilling of up to five kilometres in length, although they are unlikely to extend beyond three kilometres. The actual surface disturbance footprint will be approximately 112 ha. The disturbance footprint is also fixed at the proposed locations (Figure 1-2) and BNR does not seek flexibility in the proposed disturbance footprint under this Proposal.

2.2 Justification

The previous operator of EP 371 conducted an initial HFS exploration program in 2015. This program included HFS of two wells (Asgard 1 and Valhalla North 1) previously drilled in 2012. In the lead up to, and during, this 2015 HFS program, a large amount of scientific data was collected. This data demonstrated that HFS activities in this location could be done safely and with low risk to the environment.

The initial exploration program within EP 371 considered differences in hydrocarbon flow rates between vertical zones of the Laurel Formation to identify those formations that provide the best flow rates. The program demonstrated that the Laurel Formation produces high quality wet gas.

The purpose of this Proposal is to further appraise the tight gas resources of the Laurel Formation, in addition to other resources present in the Devonian Formation within EP 371. The Proposal covers the drilling and HFS of up to 20 wells within EP 371 to enable the extent of the reservoir to be further appraised and mapped.

The Proposal boundary for this referral has been defined as the ‘Development Envelope’ in accordance with the EPA instructions on how to define the key characteristics of a Proposal. However, it should be noted that the surface disturbance area, or footprint, will comprise approximately 112 hectares with the disturbance locations fixed as per Figure 1-2.

2.2.1 Proposal alternatives

Several exploration concepts were considered in the final selection and design of this Proposal, including:

- vertical versus horizontal well design
- staging the program
- well testing philosophy
- well site selection.

2.2.1.1 Vertical wells versus horizontal well design

The benefit of horizontal well design is in reducing surface impact—multiple wells can be clustered on a single well site, which allows multiple subsurface targets to be tested. BNR has chosen horizontal well design to limit the environmental footprint associated with this Proposal. As a result, BNR has halved the surface impact by using up to 10 well sites for up to 20 exploration and appraisal wells. However, should a vertical well be considered preferable for appraisal purposes, horizontal drilling may not occur at all well sites or for all wells.

2.2.1.2 Staged approach

As detailed in Section 2.4.1, BNR has separated the Proposal into two phases. The initial phase (Phase I) is to identify the minimum number of wells and spacing throughout the Development Envelope to confirm that commercially viable resources are present. This should be achieved through the drilling of six wells. At the

completion of Phase I, if the outcomes of the exploration and appraisal program and subsequent economic modelling indicate commercial production is not feasible, Phase II (up to 14 wells) will not be done. By minimising the number of wells required to achieve Phase I objectives, BNR has minimised the potential impacts if Phase II is not implemented.

2.2.1.3 Well testing philosophy

The main options or alternatives to reduce environmental impact associated with this Proposal relate to the well testing operations and the ability to prevent or reduce flaring activities. As detailed in the Greenhouse Gas Environmental Management Plan (GHGEMP) and in Section 5.7, BNR is continuing to investigate alternatives to flaring gas during well testing. The practicability and feasibility of implementing these alternatives will be further clarified as the design of the Proposal progresses.

2.2.1.4 Well site selection

Multiple constraints must be considered when locating well sites, including environmental sensitivities, proximity to social receptors, native title boundaries, and geological prospectivity. BNR conducted ecological surveys to understand the potential environmental sensitivities that have the potential to be impacted. Based on this data, BNR has re-aligned access tracks to prevent impacts to conservation significant species. Optimal well site selection enables environmental impacts to be minimised, as they have been for this Proposal. The entire area of proposed surface disturbance has been covered by flora and fauna surveys. In addition, BNR intends to undertake further pre-construction surveys to ensure that priority flora or fauna will not be adversely affected by this Proposal.

The geological prospectivity of an area is identified by acquiring and interpreting seismic data. This data enables geological prospects to be mapped and the subsequent well locations and appropriate design to be identified. For this Proposal, the underlying geological formations were studied to understand the depth and thickness of the target Laurel Formation, as well as the depth of various formations to useable aquifers. This information is calibrated to data collected from petroleum wells drilled near the Development Envelope, which provides more accurate information on the formation depths.

In accordance with the approach outlined in the EPA Guidance – Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures (EPA, 2021a) and Procedures Manual (EPA, 2021b), this ERD considers impacts in relation to the proposed well locations within the Development Envelope and includes requirements for continued baseline and ongoing surveillance monitoring at the specific well locations before any disturbance activities occur.

2.3 Proposal location

Table 2-1 lists the coordinates of the Development Envelope; the area is shown in Figure 1-2. Table 2-2 lists the coordinates of the well site locations; these are shown in Figure 1-2. For this Proposal, 2 wells are planned for each well site.

Table 2-1: Coordinates of the Development Envelope (GDA 94, Zone 51)

ID	Latitude	Longitude
1	−17.99853	124.75168
2	−17.99854	124.75926
3	−18.00684	124.76969
4	−18.00698	124.83774
5	−18.02966	124.84703
6	−18.03715	124.86095
7	−18.05179	124.87666
8	−18.11532	124.94590
9	−18.13102	124.98873
10	−18.15030	125.00193
11	−18.16707	125.01764

ID	Latitude	Longitude
12	−18.17973	125.02107
13	−18.18563	125.03620
14	−18.19241	125.04833
15	−18.22311	125.06868
16	−18.26023	125.07796
17	−18.28700	125.08449
18	−18.33193	125.08459
19	−18.33193	124.75126

Table 2-2: Coordinates of the well site locations (GDA 94, Zone 51)

Well	Latitude	Longitude
Alfheim	−18.207772	124.882912
Jotunheim	−18.253224	124.787923
Midgard	−18.14258	124.776958
Muspelheim	−18.103833	124.844723
Nidavellir	−18.023477	124.773575
Proposed Well 1	−18.208448	124.825451
Proposed Well 2	−18.237182	124.934808
Proposed Well 3	−18.276184	124.974959
Proposed Well 4	−18.290737	125.051452
Vanaheim	−18.213578	124.796585

The Development Envelope is situated in the West Kimberley district. The closest public drinking water source areas (PDWSA) are the Camballin and Fitzroy Crossing water reserves, approximately 60 km west and 51 km east, respectively, of the Development Envelope.

HFS activities within the Development Envelope are supported by the Traditional Owners on whose land the proposed activity is situated. This is based on their understanding of HFS activities on their country and the environment as informed by their first-hand experience of HFS activities, independent advice received from their experts, and the economic benefits the Proposal would bring to the Yungngora and Warlangurru groups.

Further information regarding relevant stakeholders is provided in Section 5.5. Table 2-3 and Table 2-4 summarise the key elements of the Proposal. An activity overview is provided in Section 2.4.

Table 2-3: Summary of the Proposal

Proposal Title	Valhalla Gas Exploration and Appraisal Program
Proponent Name	Bennett Resources Pty Ltd (BNR)
Short Description	The Proposal is to undertake an unconventional exploration and appraisal drilling program within EP 371, located in the Canning Basin, West Kimberley of Western Australia. The Proposal includes constructing up to 20 exploration wells within 10 well sites. The intent of the Proposal is to further explore and appraise the extent of the tight gas reservoirs present from the Laurel through to the Devonian Formations, at depths ranging from 2,000 m to 5,000 m below ground level. The main target is the Laurel Formation with hydrocarbon shows present at depths between 2,000 m and 4,000 m below ground level. The total area of the physical disturbance footprint for the Proposal is ~112 ha, which includes some previously disturbed areas. The estimated maximum amount of clearing for the Proposal is <110 ha and comprises: • well sites ~41 ha • access tracks ~62 ha • camps ~3 ha. The exploration and appraisal program is expected to commence in 2024 or 2025.

Table 2-4: Location and proposed extent of physical and operational elements

Element	Location	Proposed extent
Physical elements		
Clearing for wells, access tracks and accommodation camps	Figure 1-2	No more than 110 ha
Gas exploration wells	Figure 1-2	No more than 20 wells at 10 well sites
Operational elements		
Water abstraction for process water and camp supply	Figure 1-2	Up to 100 ML per well via groundwater extraction bores
Gas exploration method	N/A	Unconventional (hydraulic fracture stimulation)
Well design	N/A	Vertical wells with horizontal HFS wellbore sections
Hydraulic fracture stimulation intervals	N/A	Up to 70 intervals per well
Water retention pond	Figure 1-2	One pond per well site with a capacity of 114,400 m^3, to hold raw bore water and produced formation water
Well test flare pit	Figure 1-2	One per well site. Based upon availability of equipment at the time, there is the option for a flare stack to combust gas off the separator
Project life	N/A	7 years

2.4 Activity overview

BNR plans to conduct the activities detailed in this Proposal over two phases. Phase I is an initial exploration and appraisal phase with six wells, and Phase II is a further exploration and appraisal phase with up to an additional 14 wells. Section 2.4.1 summarises the activities, which are very similar, in each phase. Sections 2.4.2 to 2.4.5 detail the key work stages and their associated tasks. Machinery and equipment, personnel, and supplies will be mobilised to the well sites and associated camp site.

2.4.1 Phases

2.4.1.1 Phase I – Initial exploration and appraisal

The purpose of the initial exploration and appraisal phase is to confirm and appraise the positive results from previous exploration activities within EP 371. BNR expects that the initial 6-well program is sufficient to achieve these key objectives:

- acquire quality geological data and confirm the validity of target zones for new or further testing
- evaluate the continuity of the regional stratigraphy and integrate information with seismic data

- use the collected data to inform vertical completion and/or horizontal targeting
- perform extended appraisal and testing on the selected zone(s) to determine economic viability of an ongoing drilling program.

The initial six well locations selected are believed to be the most gas prospective and are strategically located to de-risk Phase II drilling activities. Following completion of Phase I, if the outcomes of the exploration and appraisal program and subsequent economic modelling indicate commercial production is not feasible, Phase II of this program will not proceed.

2.4.1.2 Phase II – Exploration and appraisal

If Phase I indicates commercial production is economically feasible, it will be followed by the Phase II drilling program that will continue to appraise the reservoir and its potential. BNR expects that up to a 14-well program is sufficient to achieve these objectives:

- prove continuity of productive tests from the Phase I program to further develop the economic model of the resource
- test the intervals that showed promise in Phase I but were not able to be fully or definitively tested for any variety of reasons. Given the productive stratigraphic column is >2000 m, it is possible that not all zones of significant interest may be adequately tested during Phase I
- test and evaluate zones of interest in Phase I that were unable to be adequately assessed for various reasons (e.g. drilling or completion issues, timing, weather, logistics, etc.)
- evaluate the operational feasibility and productivity of longer horizontal sections.

2.4.2 Site preparation

Site preparation comprises:

- civil activities including clearing vegetation and constructing well sites
- constructing well site ponds, pits, sumps, and well cellars
- installing groundwater extraction and monitoring bores.

Following pre-construction flora and fauna surveys, native vegetation will be cleared for each well site, associated access track, and for the main workers' camp. Cleared vegetation and associated topsoil will be stockpiled and used for future site rehabilitation. Once cleared, the well sites will be levelled (or graded), sheeted with gravel (or similar stabilising material) to support compressive loads, or stabilised using cement. Well sites will have a firm subgrade and will be flat with a slight taper to allow for adequate site drainage. Civil works will be undertaken using various heavy and light vehicles. A vehicle-mounted diesel tank will be used to refuel these vehicles.

At least two groundwater monitoring bores will be constructed at each site, and data collected prior to drilling activities commencing. This data will be analysed with the baseline data presented in this ERD, in order to inform an updated baseline specific to each well site. The monitoring bores are planned to be installed down the hydraulic gradient of the well sites, as per the Guideline for Groundwater Monitoring in the Onshore Petroleum and Geothermal Industry (DMP & DoW, 2016).

Ponds, sumps, and pits will be constructed after the well site is prepared and before drilling activities commence, including:

- ponds and sumps:
  - water retention and produced water evaporation pond
  - drilling fluid and cuttings 'mud sump'
- pits:
  - well test flare pit
  - vertical seismic profile pit

- well cellars.

Ponds and sumps will be constructed adjacent to the constructed hardstand and lined with a synthetic membrane, as per the Department of Water – Water Quality Protection Note 26 (WQPN) (DoW, 2013). All lined storage compounds will have sufficient freeboard (at least 500mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowing for any evaporative water loss and the effects of any water re-use recovering system. Pits will be constructed within the well sites; these are expected to comprise either concrete, coated metal, or engineered soils and will be impermeable as per DWER requirements.

Well cellars are cavities below ground level where the wellhead is installed. The well cellar is used to hold back the surrounding soils around the wellhead area so personnel can safely work inside this area during drilling and well intervention activities.

Under this Proposal, BNR intends to construct at least two groundwater extraction bores close to or on the edge of each well site. The extraction bores will provide water, as required, for the entire drilling and HFS activities.

2.4.3 Drilling activities

Drilling activities will comprise:

- mobilising the drilling package, ancillary services, rig camp, personnel, and supplies
- conducting drilling activities
- logging activities
- casing and suspending the well or, if required, plugging it.

Once the well sites are prepared, various equipment, packages and supplies will be mobilised to site. A small rig camp will be established on the well site. The rig camp will have a small number of sleeper units housing around eight people, a generator skid, a lunchroom, a training / meeting room, a toilet block, a mud lab / service contractor office and offices for key personnel.

A main workers' camp will also be established. The main workers' camp will house most of the workforce for the duration of activities under the Proposal, and will comprise accommodation units, a kitchen, laundry, dining room, utility (with water storage), ablutions and gym facilities.

All electricity on site will be generated using diesel-powered generators or natural-gas powered generators.

Potable drinking water will either be trucked to location and stored onsite or sourced from groundwater bores onsite and treated onsite using reverse osmosis units. Any spoil generated during the construction of the water bores will be spread in situ—this practice is identical to installing water extraction or monitoring bores in other industries.

Toilet facilities will either comprise mobile anaerobic treatment units (ATU) or septic and leach drain systems. The anticipated average daily wastewater volume is estimated to be <400 L/day at the well site camp and <2,000 L/day at the main workers' camp. If ATU are used, treated wastewater will be disposed of through sprinkler surface irrigation systems; sewage sludge will be stored and disposed of in accordance with regulatory requirements.

To support drilling and HFS activities, diesel will be stored in bulk at the well site. It is expected that storage volumes on site will be ~75,000 L. A trailered tank or skid-mounted fuel cell will be used for mobile refuelling of equipment (e.g. generators and lighting towers) around the well site.

A designated storage area will be set up on each well site for storing chemicals and hazardous materials. In accordance with the Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007, a bunded area will store oil, fuel and hazardous liquid chemicals.

When drilling the petroleum wells, each hole section will be drilled using conventional drilling techniques and a low-toxicity mud system. The cuttings produced from drilling will be stored in the mud sump. As each well section is drilled to the section total depth, a casing string will be run and cemented in place, then pressure tests will be done to verify the integrity of the casing string. Both the casing and cement will be designed to

withstand the environmental conditions they are exposed to over the life of the well, including following well decommissioning. Figure 2-1 and Figure 2-2 illustrate the indicative well designs for Phase I and Phase II wells, respectively. The vertical depth may change for each well depending on the formation structure and the target interval chosen, and the horizontal length of any laterals may vary up to 5,000 m maximum length, although they are unlikely to be longer than 3000 m. Drilling is likely to be conducted 24 hours per day.

Throughout the drilling process, data relating to the subsurface geology will be constantly collected, reviewed and assessed to better understand the geology and to inform drilling decisions. Through this process, specific fault zones concerns will be identified and steps taken, including if required, the cessation of drilling and the shutting in of that well, to ensure potential adverse impacts to the environment are kept ALARP.

Once the petroleum wells reach total depth and the target formation evaluated using wireline logging, the final casing string is cemented in place. This method measures the downhole properties and attributes of the Laurel Formation. If technical issues occur during the drilling activity, contingency activities may be required, which may include restarting (re-spudding) or side-tracking the well. A side-track involves drilling a secondary wellbore away from the original wellbore. This may be done to avoid an unusable or inaccessible section of the original wellbore.

Once complete and if required, the wells will be prepared for perforation, HFS treatment, and well testing. The wells will be suspended before any of these activities are conducted. During suspension, the well sites will be regularly inspected and maintenance works undertaken as necessary.

While this project covers exploration and appraisal only, should a commercially viable resource be found, it is recognised that any of these wells may form part of a production program in the future. ISO Standard 16530-1:2017 will be adhered to throughout the planning, construction, testing and decommissioning phases to effectively manage well integrity during the well life cycle. All conditions placed on the approved well management plans and drilling approvals will be met, including daily reporting to DEMIRS of pressures and drilling fluids during well activities. This would ensure that well integrity would be continuously monitored so that any well integrity anomalies or failures could be immediately identified and addressed. The well management plans will address:

- organizational structure and tasks related to well integrity management
- well barriers / performance standards
- monitoring and surveillance requirements
- annulus pressure management
- well barrier maintenance requirements
- risk assessments for well barrier failures
- reporting and documentation of well integrity activities
- periodic well reviews.

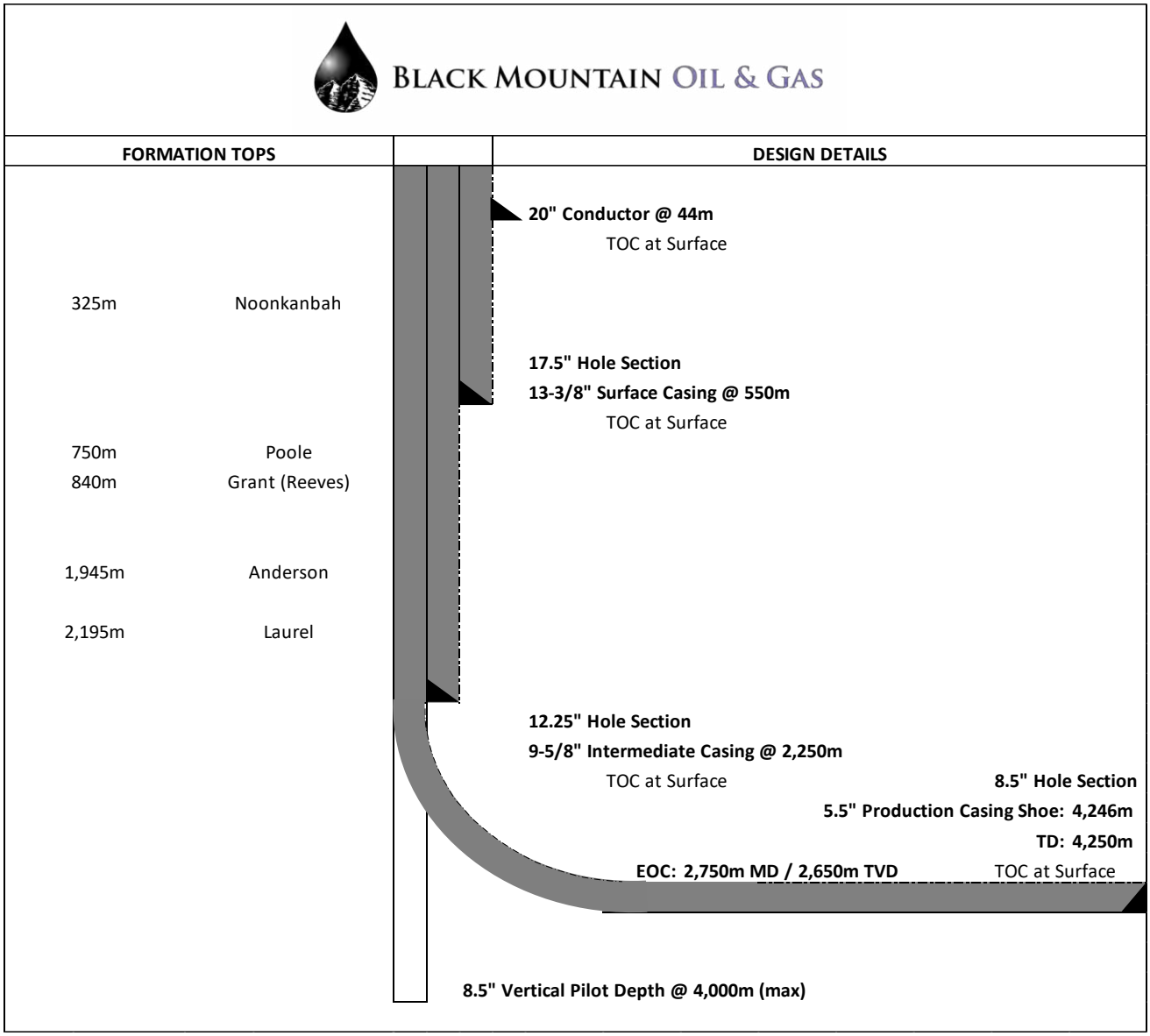

Figure 2-1: BNR Phase I indicative well design

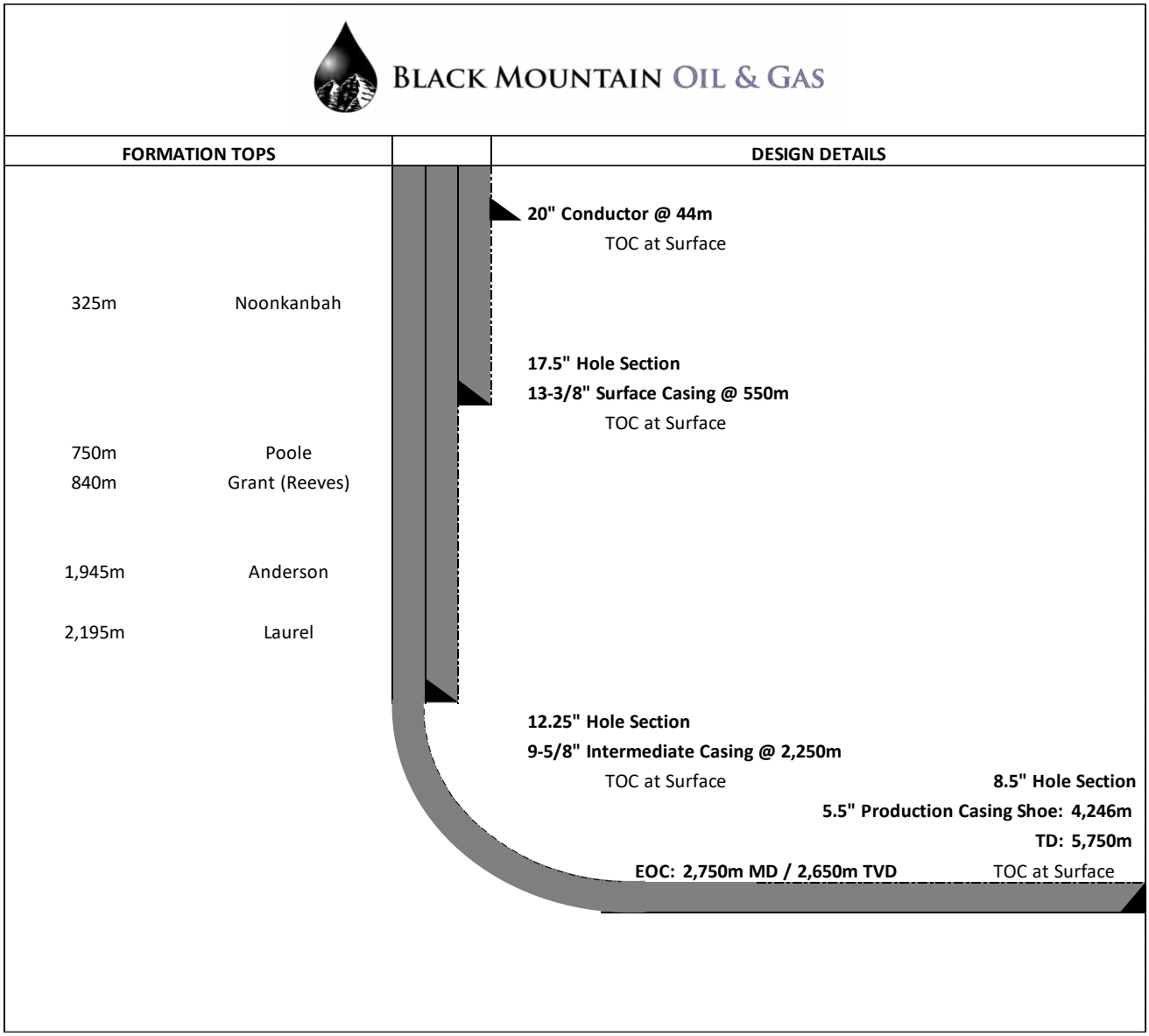

Figure 2-2: BNR Phase II indicative well design

2.4.4 HFS activities

HFS activities comprise:

- mobilising HFS spread (equipment), personnel and supplies
- well perforation and clean-up
- HFS treatment
- well testing
- well suspension.

Once the wells are constructed and their integrity is independently validated, the HFS spread, packages, and supplies are mobilised to site. Figure 2-3 shows typical surface infrastructure that may be required for the Proposal. Approximately 70 personnel are expected to be located at a single well site during HFS activities. The HFS spread comprises high-pressure pumps, mixing unit (to blend water, proppant, and chemicals), the command centre, and coil tubing unit (or equivalent). All high-pressure surface lines and equipment used (including the wells) will be pressure tested during rig-up to ensure their integrity before HFS commences.

Figure 2-3: Typical HFS layout

Once the integrity of equipment has been verified, any plugs that have been placed into the well to suspend the well will be removed, with any remnant fluid or cement returned to surface and stored in the mud sump, and the casing perforated to provide access to the target formation. If required, the casing will be perforated at selected intervals, which are currently expected to be 2–100 m apart.

After well perforations are complete and the well is cleaned up, HFS can commence. Water from the water retention pond is pumped into the blenders where the proppants (sand) and chemical additives are mixed. Chemical additives typically comprise ~2% of the HFS fluid composition—the system proposed to be used is described in Section 2.4.4.1 and detailed in Appendix A. In accordance with the PGER(E)R, the chemical composition of the downhole fluid system will also be assessed by DEMIRS.

Once mixed, the downhole fluid system water will be directed into high-pressure pumps where it is then pumped down the well. Each HFS treatment will create hairline fractures in the target formation with the proppant holding these fractures open, allowing gas to flow to the wellbore. Depending on the well design, the well location and the reservoir response following testing, the wells may receive up to 70 treatments.

Following HFS treatment, the wellbore may be cleaned out with coil tubing (or equivalent), with any remnant fluids or proppant returned to surface and stored in the mud sump. This prepares the well for testing.

The entire well testing manifold—from the well to a water retention pond and flare—are a closed piping system. During well testing, reservoir fluids, including produced gas, are flowed back to the surface, and directed through 3-phase separators (if required) where water, condensate (if present), and gas are separated into their respective phases (Figure 2-4). The fate of the three reservoir fluid phases is:

- gas: any gas is routed to the well test flare, where it is flared off

- condensate (liquid): based upon previous characterisation of fluids, low volumes of condensate are expected to be produced (<25 bbl); this will be routed to the well test flare and flared off
- water: formation water produced from well testing is stored in a designated lined water retention pond and left to evaporate.

The volume of flowback / produced water is estimated to be in the order of 8 ML per well during the testing phase, however for the purposes of planning pond sizes, extremely conservative figures have been used by assuming a 70 per cent recovery of approximately 57 ML per well. An overview of water volumes and proposed uses (site balance) is included in Section 2.4.5.

Well testing runs for 24-hours a day and is expected to continue for several months. However, at any time during testing, activities may cease to allow equipment to be serviced or a change to occur. BNR has estimated that to collect the required data the well must flow during the period of maximum gas concentration for up to 90 days, which may also occur in stages.

The volume and type of fluid coming back to surface will be monitored and recorded—these data will be essential for determining the quality of the reservoir. Sections 5.4 and 5.8 have more information about the characterisation of formation water produced from well testing.

Once well testing is complete, the well will be suspended or shut-in, and well test equipment, ancillary services, and personnel demobilised from site.

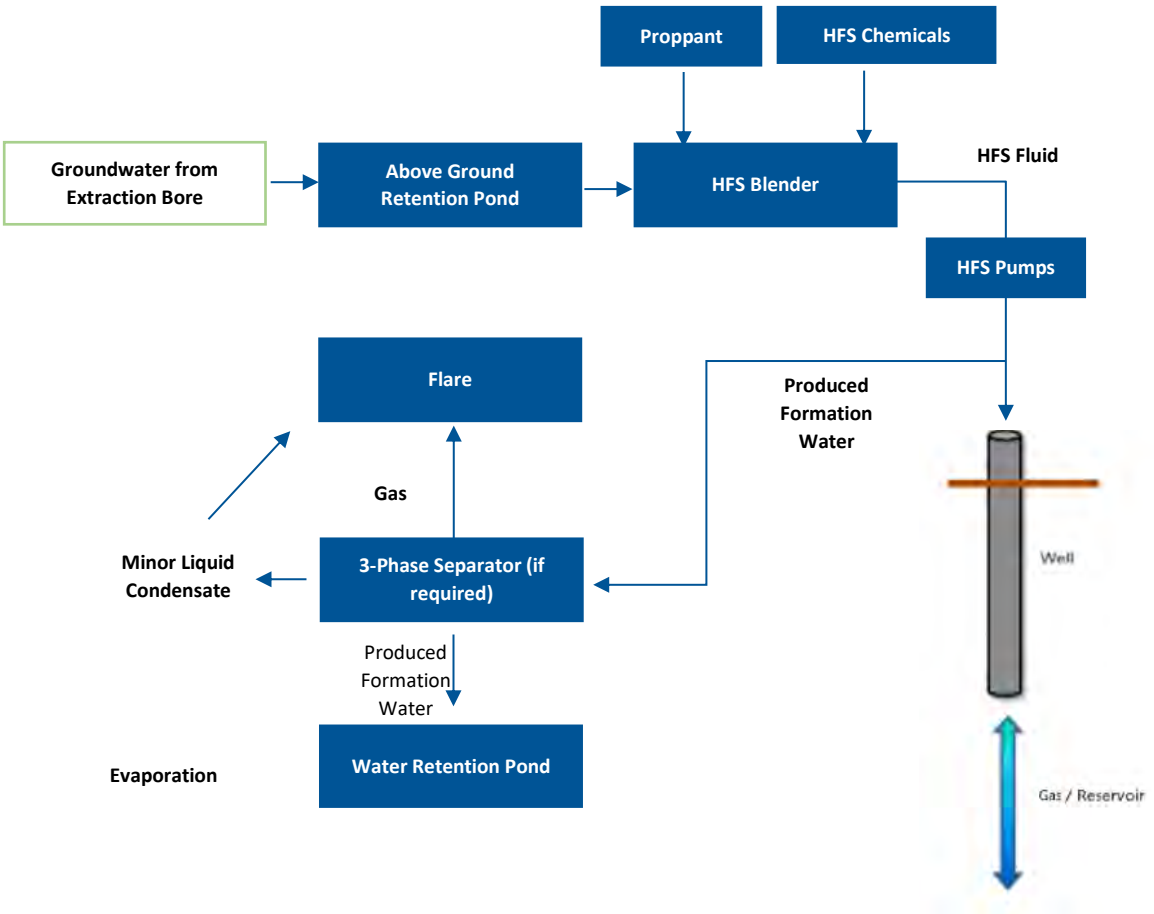

Figure 2-4: Fluids and gas cycle during HFS

2.4.4.1 HFS fluid composition

The types and use of HFS fluids have evolved greatly over the last 60 years and continue to evolve due to the investment of significant research effort. This has led to the development of 'green' HFS fluids that optimise environmental objectives and outcomes. One of these is Halliburton's CleanStim Aus® HFS fluid system, which is proposed to be used for this program. Ecotoxicity testing of the combined fluid system was

previously undertaken by the previous operator and demonstrated that the fluid system is of very low toxicity (Buru Energy, 2018).

A chemical inventory for the HFS fluid system is included as Appendix A.

2.4.5 Water Balance

BNR has developed a simple site water balance table to inform the risk assessment documented in Section 5. This water balance is simply divided into three tables that detail water use on a per well basis (Table 2-5), per well site basis (Table 2-6) and on a program basis (Table 2-7).

On the expectation that BNR plans to execute up to four wells in a single year:

- the total groundwater abstraction per year up to 400 ML (using a conservative estimate of 100 ML/well)
- the total volume of flowback / produced water managed per year would be up to 32 ML (8 ML/well), however for the purposes of this water balance, a 70 per cent recovery rate has been used, of up to 228 ML/year (this level of recovery normally takes around three years).

Water use figures have been conservatively estimated to be:

- 2000 ML total water use for the full exploration Proposal (calculated at 1820 ML, rounded up to 2000 ML for a conservative estimate)
- average water use per annum: 260 ML (on the basis that, while four wells can be constructed in one year, that will not be the case every year)
- maximum water use per HSF event: 1.6 ML per stage
- maximum water use per well: 100 ML (calculated at 91 ML, rounded up to 100 ML for a conservative estimate)
- camp use (potable, dust suppression, processing, etc, per well): 0.6 ML
- total maximum water use per well site: 182 ML, rounded up to 200 ML for a conservative estimate
- total produced water and flowback water volumes per well / well site: 8 ML/16 ML (however, for the purposes of this site water balance, a 70 per cent produced water recovery has been used, so 57/114 ML)
- total produced water and flowback water volumes for the whole project during the testing phase: 160 ML (although using the conservative figure of 1140 ML)
- site water balance: 317 ML per site, using conservative figures (see below).

Table 2-5: Site total water balance (per well)

Element	Initial Storage	Initial Volume	Expected final volume (for design purposes)	Final storage
Drilling water	Water retention pond [1]	100 ML	100 ML	Mud sump
Flowback / produced water during HFS Stimulation	Assuming 1 ML of groundwater (Liveringa) + 0.1 ML of produced water (Laurel) (per stimulation event and 70 stimulation events per well			
	Water retention pond	8 ML	57 ML	Water retention pond
Camp	Assuming 160 L per person per day, 50 people onsite for a period of 75 days per well			
	Onsite / offsite storage tanks	0.6 ML	0	N/a
Dust suppression / other	Water retention pond	< 1 ML	0	N/a

[1] Water used during the drilling phase is transferred from the water retention pond to the mud sump during drilling activities (where drill cuttings and drill fluids are stored).

Element	Initial Storage	Initial Volume	Expected final volume (for design purposes)	Final storage
Site total water balance for a single well at a single wellsite		158.6 ML (conservative)		

Table 2-6: Site total water balance (per wellsite x 2)

Element	Initial Storage	Initial Volume
Drilling water	Water retention pond [2]	200 ML
Flowback / produced water during HFS Stimulation	Produced water pond	114 ML[5]
Camp	Onsite/offsite storage tanks	1.2 ML
Dust suppression / other	Water retention pond	<2 ML
Site total water balance for two wells over multiple years		317 ML

Table 2-7: Site total water balance (entire program x 20)

Element	Initial Volume (per well/one year)	Total Volumes (for 20 wells over 7 years)
Drilling water	100 ML	2,000 ML
Flowback / produced water during HFS Stimulation[3]	8 ML	1140 ML[4]
Camp	0.6 ML	12 ML
Dust suppression / other	1 ML	20 ML
Site water balance over 7 years and 20 wells		3172 ML[5]

2.4.6 Site reinstatement/decommissioning

Site reinstatement/decommissioning comprises:

- suspending or shutting in the wells
- plugging decommissioned wells permanently with multiple concrete plugs (in accordance with DEMIRS accepted Well Management Plan) to ensure the reservoir is sufficiently separated from aquifers and the surface (Section 2.5.1.2)
- removing all infrastructure from the sites (with the exception of any material as requested by, and agreed with, the pastoral station landholders)
- sampling pond and sump contents (liquids and solids) to ensure contamination has not occurred, and to address any contamination issues
- sampling soil beneath pond liners following their removal, to ensure contamination has not occurred, and to address any contamination issues
- evaporating, draining if necessary, and backfilling ponds, sumps, and pits
- ripping and contouring hardstands as required

[2] The second wellsite will only be drilled where the pond has capacity to support an additional well. Wells (on the same wellsite) may be drilled 1-2 years apart to enable water contents to evaporate. Ponds are designed to sufficiently manage water requirements from a single horizontal well.

[3] Flowback water will include water present in the reservoir, but mostly comprise water initially pumped into the reservoir during HFS process. Although this water has been "double counted" here in reality, the site balance will likely comprise Drilling water (2000 ML) – Flowback water (1140 ML).

[4] Note, this figure provides for a 70% recovery over the life of the Program.

- respreading topsoil and stockpiled vegetation.

If installed site infrastructure is no longer required after all site activities are completed, then where appropriate, infrastructure will be demobilised and any areas of disturbance will be reinstated in accordance with any land access agreements (as required under Section 20 of the PGER Act). Specifically, it is expected that sites be returned to the pre-industry land use of the pastoral stations dedicated to cattle rearing and as agreed with the pastoral station landholders.

Prior to decommissioning/reinstatement, BNR will sample and analyse pond and sump contents. Residual drilling fluid solid waste and drill cuttings subsoils will be sampled for contaminants of potential concern (CoPC). Soil samples will also be analysed from beneath the water retention pond and sump liners and from the flare to verify contamination from CoPC has not occurred.

Soil samples will be compared to site baseline results and relevant screening levels, in accordance with Section 5.2.3.2. During decommissioning/reinstatement, any soil, drilling fluid solid waste, drill cutting subsoils, etc. that do not meet landfill guidelines will be removed and disposed of at an appropriate waste disposal facility.

Before liners are removed, fluid contained within water retention ponds, sumps, and pits will be left to naturally evaporate with any remaining residue removed and disposed of at an appropriate water disposal facility. Any previously excavated areas will be reinstated using backfilled stockpiled topsoil, with any remaining vegetation spread over this area.

2.5 Well lifecycle and well integrity

2.5.1 Well lifecycle

Figure 2-5 summarises the lifecycle of an indicative well. No production phase is proposed under this Proposal. At the end of the activity, the wells will either be decommissioned (provided for within this Proposal) or suspended to enable for future development. While this project covers exploration and appraisal only, should a commercially viable resource be found, it is recognised that any of these wells may form part of a production program in the future. ISO Standard 16530-1:2017 will be adhered to throughout the planning, construction, appraisal and decommissioning phases in order to effectively manage well integrity during the well life cycle. Any and all conditions placed on the approved well management plans and drilling approvals will be met, including daily reporting to DEMIRS of pressures and drilling fluids.

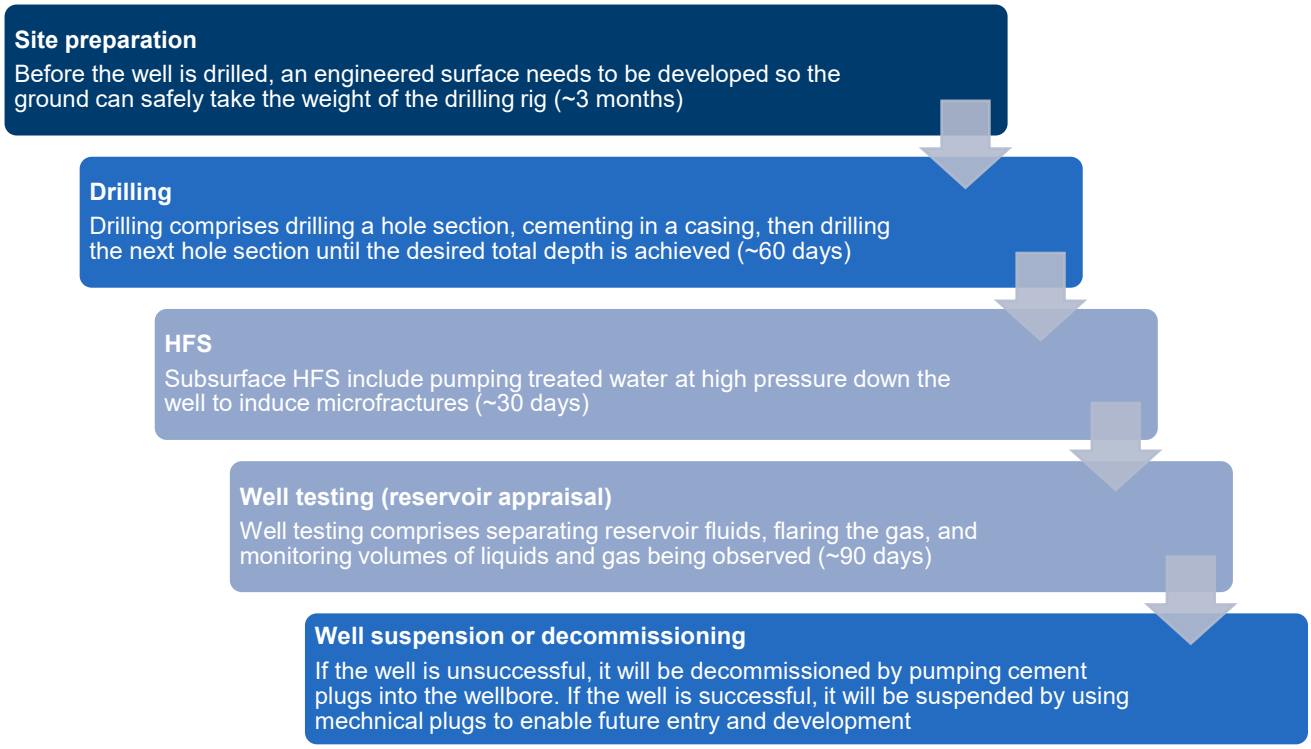

Figure 2-5: Well lifecycle under this Proposal

2.5.1.1 Well suspension

If the evaluation confirms the well is successful, the well will be suspended (casing will be installed and cemented to the surface) to enable potential future reservoir evaluation and other activities. The well site will enter into a care and maintenance phase until the future works program is developed and approved under separate and subsequent Part IV EP Act Ministerial Approvals.

As all site infrastructure may be retained, a care and maintenance regime will ensure the integrity of existing equipment is maintained. During this phase the well site will be monitored and inspected at least annually to ensure ongoing compliance with the site risk management commitments of the well integrity plan and any other environmental approvals under the *Petroleum and Geothermal Energy Resources Act 1967*. Site inspection will typically involve a visual inspection of all infrastructure on site including the mud sump liner integrity. Should any issues of non-compliance be identified during the site inspection, the required actions to remedy such non-compliance issues will be documented and tracked until closure.

2.5.1.2 Well decommissioning

If the evaluation confirms the well is not successful, the well will be plugged back with cement as per the regulatory approved well decommissioning program. A preliminary well decommissioning plan will be included in the Well Management Plan, with the final plan approved by DEMIRS under the Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2015 based on the actual results of the drilled well prior to commencement of the well decommissioning process. Specifically, the well decommissioning objectives and activities that would be undertaken under a typical scenario include the following:

- install the barrier cement plug (plug #1) above the top of any zones containing moveable hydrocarbons to isolate the well above from the hydrocarbon zone
- install an intermediate cement plug (plug #2) to isolate any open annulus in the well from the surface
- install a surface cement plug (plug #3) to permanently isolate the well from the surface environment.

Cement plug thickness is normally a minimum of 30 m for a single barrier and 60 m for common / combination barrier (excluding any length across the zone with flow potential). Once the well is plugged with cement, the wellhead and cellar are left in place, and the drilling package demobilized from site. Removal of the wellhead and cellar will occur following departure of the rig to coincide with other civil works activity being undertaken at the site.

2.5.2 Well integrity

As previously mentioned in Section 1.4.3.2, and in accordance with ESD Item 14, BNR will manage its wells throughout their lifecycle under a well integrity management system ISO Standard 16530-1:2017).

The lifecycle of a petroleum well comprises several stages, which may be conducted at any time depending on the well status and the outcomes of the petroleum activities. A risk assessment will be undertaken for each of BNR's wells during each stage of the well lifecycle to ensure well integrity is maintained. This risk assessment will include a multidisciplinary team of personnel with different perspectives and knowledge of the Proposal activities and the Development Envelope. The risk assessment team will include personnel with drilling, environmental, health and safety expertise. The risk assessment process will be detailed in the WMPs and will involve:

- identifying the potential well integrity risks associated with the wells, including casing failure
- reviewing the causes of each risk as they apply to the well along with the preventative controls. The preventative controls for each well will be determined based on a review of available information as described in each well's well integrity workbook. The consequences of each risk event will be defined along with recovery controls should the risk eventuate
- determining the likelihood of each risk occurring through company and industry experience along with the consequences should the risk eventuate. Risks will be considered in terms of health and safety, environment, community and heritage, well activities and financial and reputational criteria with the highest risk from these criteria adopted
- an assessment to determine if each risk will be ALARP will also be undertaken, based on the current well status and the BNR's safety management system.

The following performance objectives will be in place for well integrity for each phase of the well's lifecycle:

- no contamination of recognised aquifers with reservoir fluids
- no release of reservoir fluids at surface.

These performance objectives will be met through the requirement to ensure that two barriers are in place in the wells through useable aquifers at all times. Should one of the barriers be breached, the following actions will occur:

- well will be shut-in immediately upon determining a well barrier element has failed
- well will be monitored by the field team and well pressures and surface conditions will be documented
- a risk assessment will be performed and well barriers will be reviewed
- in line with industry regulations, DEMIRS will be notified
- DEMIRS and BNR will determine an agreed upon path forward for remediation or decommissioning of the wellbore
- remediation will occur (and will vary in nature depending on which specific well barrier element has failed), it's expected that this will include:
    - isolation of the failed well barrier element
    - installation and test of temporary barrier (to maintain dual barriers)
    - removal or remediation of failed well barrier element, such as (but not limited to):

        - removing failed surface valve and installing a replacement valve
        - pumping a cement squeeze
        - installing a casing patch
        - pulling, and replacing wellhead seal assemblies
    - pumping kill weight fluid and bull heading the well
    - verifying and testing the remediated / new barrier
    - removing temporary barrier
- should the remediation be deemed unsuccessful or if the system no longer meets well integrity requirements, the well will be decommissioned
- should the remediation be successful, the well will be returned to its previous state (shut-in, producing, etc.)

In addition, geotechnical risk assessments will form part of the core workload during the Proposal. While earlier seismic surveys have highlighted the presence of faults and fractures, it is expected that additional ones, that are not able to be identified through seismic surveys, may be found as the wells are constructed. As the wells are being constructed, the subsurface geology will be constantly reviewed and assessed against other data sources. BNR will utilise collected data to ensure well seal effectiveness in providing a suitable geological seal between useable aquifers and targeted formations.

Given the information gathered to date through seismic surveys and earlier well construction, it appears that faults in this area are closed and strike in a direction that is approximately orthogonal to the maximum horizontal stress. Although they may negatively impact on fracture propagation, they pose no geomechanical hazard for upward propagation of fracturing fluids or hydrocarbons into the recognised aquifers as the activation energy required to delate faults or fractures in tension will be higher than overburden, which means the fracture growth would rotate to horizontal before opening such faults in tension (Appendix B).

2.6 Waste characterisation and management process

BNR is committed to ensuring that all Proposal activities have minimal impact on the environment and existing land users. Waste is defined as any substance that is rejected, unwanted, surplus, or abandoned and is discarded, emitted, or deposited to the environment. It is BNR's legal responsibility to minimise and appropriately manage all wastes generated by its activities. As such, BNR has defined and will apply a waste management process for the duration of the Proposal.

As part of its waste management strategy, a waste characterisation was undertaken, where all aspects of the Proposal were examined to identify and characterise waste products generated from each well site. Any controlled waste will be stored, transported, and disposed of in accordance with the Environmental Protection (Controlled Waste) Regulations 2004 and *Radiation Safety Act 1975* (WA). Table 2-8 summarises the various types of waste generated from each well site and the management methods and controls that BNR intends to implement.

BNR has an Indigenous Land Use Agreement (ILUA) and a Land Access and Use Agreement (LAUA) in place with the landowners, the Yungngora and the Warlangurru People, respectively. The land use agreements state that BNR should keep each activity site clean, tidy and free from waste, and that BNR agrees to take all reasonable precautions to avoid any contamination, pollution, or material environmental harm to the landowners' countries, including to any groundwater or watercourse on the owners' land. BNR will continue to comply with conditions set out in these agreements.

In addition, given seasonal rainfall patterns, all on site waste prior to disposal at an appropriately licensed facility, will be stored in such a way that risk of contamination through a major flood event will be reduced to ALARP. An assessment of flood risk to the project identified that the proposed well sites are higher in the landscape than Fitzroy River flood levels in a 1:100-year event, such as that which occurred in January 2023.

Table 2-8: Well site waste characterisation

Proposal waste products	Landfill class[5] (DWER, 2019)	Proposed management, storage, and disposal methods
Oily waste (liquid and solid)	Hazardous waste	As controlled waste, oily waste will be placed into empty oil drums within a bunded area and removed from site for disposal at an appropriately licensed facility by a licensed waste disposal contractor, in accordance with the Environmental Protection (Controlled Waste) Regulations 2004.
Wastewater	N/A	If there is a risk of contamination, wastewater generated from clean-down of equipment will be contained and transferred to the mud sump. If there is no risk of contamination and fresh water is used, it may be released to the environment.
General waste including food waste, plastics and rubber products, empty mud and cement product sacks, etc.	Putrescible waste Inert waste (Recyclable material[6])	Placed into general waste rubbish skips with lids or net covers and removed from site for disposal at an appropriately licensed facility by a licensed waste disposal contractor.
Hydrocarbon waste (oily rags, empty hydrocarbon containers etc.)	Hazardous waste	As controlled waste, hydrocarbon waste will be placed into hydrocarbon waste rubbish skips with lids and removed from site for disposal at an appropriately licensed facility by a waste contractor, in accordance with the Environmental Protection (Controlled Waste) Regulations 2004.
Steel scrap (including steel casing protectors and drill line)	(Recyclable material[4])	Stored in a central area after use. Subsequently placed into steel bins and removed from site for disposal at an appropriately licensed facility by a licensed waste disposal contractor.
Wooden pallets and other timber goods	Putrescible waste	Recycled where practicable. These will be stacked onsite or placed into timber-waste rubbish skips (as appropriate) and removed from site for disposal at an appropriately licensed facility.
Sewage	Putrescible waste	Sewage will be managed and treated using ATU or a septic system with leachate drains, in accordance with the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974. Disposal of the treated effluent will either be through offsite surface irrigation or through the leachate drains, in accordance with WA Department of Health (DoH) requirements. Sewage sludge will be stored on site in sealed tanks and removed from site for disposal by a licensed waste disposal contractor.
Metal drums (uncontaminated)	(Recyclable material[4])	Stored in a centralised location as well as in a steel-waste skip and removed from site for disposal at an appropriately licensed facility by a waste contractor.
Cuttings and muds	Inert waste	Stored onsite in the mud sump. When drilling is completed, cuttings and muds will be tested before the site is reinstated. Disposal options will be informed by the presence of contaminants in comparison with acceptable regulatory limits. BNR will sample for chemicals of potential concern (CoPC). These concentrations will be assessed to understand the potential for contamination on site against existing baseline samples, consistent with the National Environmental Protection (Assessment of Site Contamination) Measure 2013, and considers ecological investigation levels and waste concentration thresholds (Section 4 of the Landfill Waste Classification and Waste Definitions 1996 (DWER, 2019). Where evidence shows that the waste will not pose an unacceptable risk to human or ecological receptors, or environmental values in the nearby vicinity (as provided by an independent subject matter expert), this material may be used as fill in situ by interring beneath a minimum of 2 m of clean overburden. If no significant volumes of produced formation water / mud filtrate are present during well testing, BNR may circulate the liquid contents of the mud sump through the flare to incinerate this waste residue from the drilling program. This provides a solution that minimises any waste legacy issues and one which is both environmentally and economically beneficial compared with other options

[5] As per the Landfill Waste Classification and Waste Definitions 1996 under the EP Act.

[6] Although recyclable material is not defined in the Landfill Waste Classification and Waste Definitions 1996 under the EP Act, BNR has included it in this table for consideration.

Proposal waste products	Landfill class[5] (DWER, 2019)	Proposed management, storage, and disposal methods
		available, consequently reducing any impacts and risks associated with legacy waste sumps to ALARP.
Produced formation water (HFS waste)	Hazardous waste	Formation water produced during well testing will be stored in lined water retention ponds on site and left to evaporate.
Gas and condensate (HFS waste)	Hazardous waste	Once passed through 3-phase separators, it is expected that gas and liquid condensate be flared off.
Radioactive waste	Hazardous waste	Drill cuttings and produced formation water produced during drilling, well testing and HFS activities have the potential to contain naturally radioactive substances. Concentrations of CoPC will be sampled and monitored to determine if cuttings can be disposed to the environment, produced formation water evaporated, or if other disposal options such as removal from site are required. Management of these wastes will be managed in accordance with the requirements of the Radiological Council and the Radiation Safety (General) Regulations 1983.

2.7 Local and regional context

As detailed in Figure 5-1, the Development Envelope does not overlap any environmental sensitivities (such as Ramsar wetlands, conservation estates, or PDWSAs). As detailed in Section 5.5.3, the Development Envelope overlays two pastoral stations (leased Crown land)—Blina Station and Noonkanbah Station—that are leased for pastoral grazing purposes. Both stations have been informed of the Proposal and BNR will continue to liaise closely with the pastoralists to keep them informed of current and upcoming activities.

The well locations are remote from residential developments, local tourist attractions and main roads. The closest receptors to the Development Envelope include a limited number of station homesteads and Aboriginal communities (Figure 1-3), which are tens of kilometres from the Development Envelope.

BNR has searched for and found no other proposed development activities near the project area.

Given the remote location of the Proposal and distance from highly sensitive environmental factors, BNR believes that the Proposal fits within the regional land use and complements future development in the Kimberley. It will provide employment opportunities for the local community and the local community fully supports the project.

3 Stakeholder engagement

3.1 Stakeholder identification and engagement process

In accordance with DEMIRS' Guideline for the Development of Petroleum and Geothermal Environment Plans in Western Australia (DMP, 2021), BNR applies the following consultation methodology for all of its activities associated with the Proposal:

- identify relevant and interested stakeholders
- determine how to undertake meaningful engagement
- provide sufficient information to ensure the stakeholder is informed
- address any objections or claims raised.

BNR has developed an engagement plan based on this methodology that includes all identified relevant stakeholders to ensure they remain informed and aware of ongoing activities within EP 371. The engagement plan details the contact details and contact frequency for each stakeholder. Each relevant engagement will be recorded to summarise issues and actions as they arise.

3.2 Key stakeholders

The Development Envelope is within the SDWK in the broader West Kimberley region. It is characterised by semi-arid rangelands, which are areas of open country used by pastoralists and Traditional Owners for various activities, including grazing cattle and hunting and collecting bush foods.

Section 5.5 describes the social context, surrounding land use, Aboriginal communities and regional towns. In summary, the Development Envelope overlays:

- two pastoral stations (leased Crown land)—Blina Station and Noonkanbah Station
- two registered native title groups, the Warlangurru people and the Yungngora people (Figure 1-3).

DEMIRS provides the following definition of stakeholder relevance to support stakeholder engagement for petroleum activities (DMP, 2021):

> *'any person or organisation whose functions, interests or activities may be affected by the proposed activities'*.

Consequently, BNR believes that relevant stakeholders are those whose functions, interests, or activities have the potential to be directly affected by the Proposal; therefore, the stakeholders for this Proposal are limited to:

- Blina Station
- Noonkanbah Station
- Warlangurru People
- Yungngora (Noonkanbah) People.

3.2.1 Pastoral stations

The Canning Basin is covered by rangeland ecosystems. Land uses within the Fitzroy River catchment include 95 per cent pastoralism (cattle grazing), with nature conservation and Indigenous Protected Areas covering the remaining areas. In 2018, the gross value of agricultural production was $77 million/year, predominantly from cattle (Merrin, Addison, & Austin, 2018). Most rangeland grazing properties are managed as pastoral leases on government-owned land (Crown land). The average size of cattle stations in the Kimberley is 230,406 ha (DPIRD, 2014), with cattle typically grazing on native and introduced vegetation that is rarely cleared for pasture or cropping.

The Development Envelope overlays two pastoral stations (leased Crown Land)—Blina Station and Noonkanbah Station—that are leased for pastoral grazing purposes.

3.2.2 Pastoral station engagement

Consultation with both stations has occurred consistently over the life of EP 371. BNR continues to keep the station owners informed of activities undertaken onsite and those planned for the future. Specifically, notifications are provided prior to accessing the pastoral station(s).

Engagement to date has identified a couple of key themes of interest including:

- Proposal footprint (and impact to grazing land)
- water source / contamination
- impacts to mustering
- ability to utilise infrastructure on completion of the activity (such as bores).

BNR continues to address these themes during engagement with the station owners in accordance with the assessments provided in this document.

3.2.3 Native title groups

The Development Envelope is overlapped by two registered native title groups—the Warlangurru People (claim application WAD509/2015, also known as the Warlangurru 1 claim) and the Yungngora (Noonkanbah) People (determination application WAD6229/1998, also known as the Yungngora Native Title Determination).

3.2.3.1 Native title group engagement

Consultation with relevant native title groups has occurred at a pace dictated by the Traditional Owners and translators have been used where required. This has allowed Traditional Owners time to digest the information provided, discuss it with their community, and make informed decisions. Engagement with the Yungngora Community (Yungngora and Warlangurru people) started in 2012 and has followed two engagement phases:

- planning phase
- inform/consult phase.

During the planning phase, a ‘Gas Roadmap’ document was developed with the Yungngora Community. This document sought to set environmental, cultural/social, and economic objectives for the native title groups through the exploration, appraisal, and development of the tight gas resource. The Gas Roadmap process was used to guide community engagement through the various stages of field development, including exploration and appraisal. Figure 3-1 is an example of the Gas Roadmap as it relates to economic development (training, employment, and contracting) with the Yungngora Community.

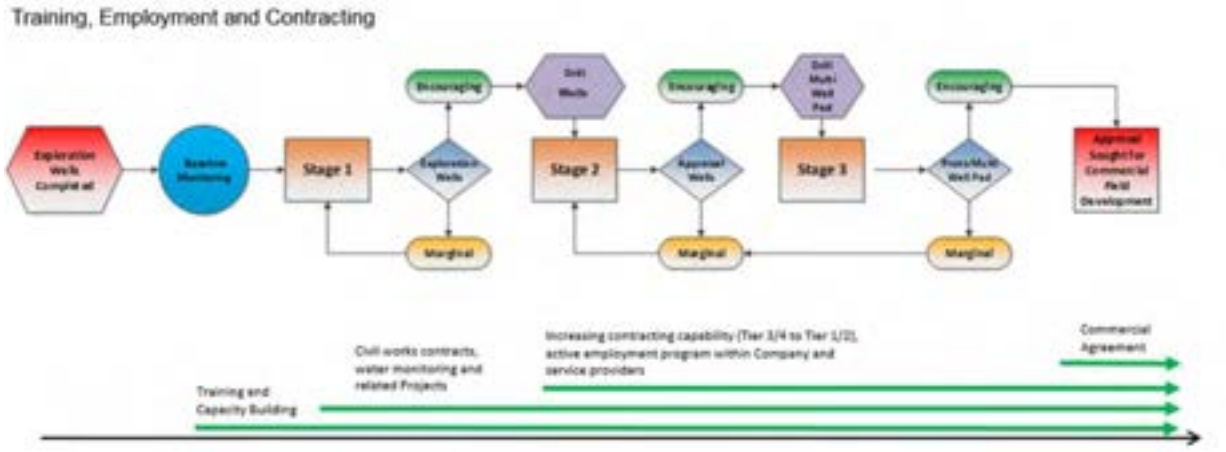

Figure 3-1: Example of Yungngora Community gas roadmap relating to economic development opportunities

During the Inform/Consult phase of engagement, an independent specialist review process was used to enable the Yungngora Community to make an informed decision about HFS activities on EP 371. This process provided access to advice from independent experts in the fields of groundwater, petroleum engineering, HFS-specific risks, and community engagement with Traditional Owners.

The Yungngora people selected their own independent specialists, who were given access to all relevant approvals documents and who reviewed the proposed activities, specifically HFS activities. The previous operator provided funding for the review, but the reviews were undertaken independent of that petroleum company unless requested by the community. The process ran for approximately seven months and included collaborative risk workshops, community meetings and information sessions with the community.

Independent specialist reviewers presented the outcomes of their review to the community and demonstrated that the 2015 HFS program would have very low risk to the environment and social values. After the presentation was complete, the community voted overwhelmingly to support the tight gas program, which included HFS activities.

Ongoing engagement has been formalised through separate land use agreements with the native title groups. Specifically, BNR has separate land use agreements in place with Yungngora and Warlangurru native title groups. Amongst other things, these agreements provide for the support of the Yungngora and Warlangurru people in the future grant of tenure required for the further development of gas resources in the area. The agreements include financial and other benefits to the native title groups and include structured processes for managing cultural, heritage, and environmental matters. The agreements also focus on employment and training opportunities for the Traditional Owners.

BNR continues to engage with the native title groups regarding the HFS activities associated with the Proposal throughout the Inform/Consult phase of engagement. BNR provides regular updates to Yungngora Aboriginal Corporation, Warlangurru Aboriginal Corporation, and the general community. This is done in a way that is consistent, culturally appropriate and respectful to the Traditional Owners, and as required by the Traditional Owners.

As detailed above, the operators of EP371 have had a long history of engaging with the Traditional Owners. All of the engagements over this time have not been summarised in this document, however this should be acknowledged given the engagement over this period has been foundational to support the strong relationships and subsequent support for the Proposal. A summary of the most recent engagement (relating to this proposal) is provided in Section 3.4.

3.3 Interested stakeholders

BNR also actively engages with relevant government departments, industry associations, and other stakeholders who operate in the broader region, including:

- WA Environmental Protection Authority (EPA)
- WA Department of Mines, Energy, Industry Regulation and Safety (DEMIRS)
- Commonwealth Department of Climate Change, Energy the Environment and Water (DCCEEW), formerly the Department of Agriculture, Water and the Environment (DAWE)
- WA Department of Water and Environmental Regulation (DWER)
- WA Department of Primary Industries and Regional Development (DPIRD)
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Shire of Derby / West Kimberley (SDWK)
- other oil and gas operators
- Kimberley Development Commission
- Regional Development Australia
- Kimberley Pilbara Cattlemen’s Association
- Pastoralists and Graziers Association

- Derby Chamber of Commerce and Industry
- Fitzroy Crossing Business Network
- Australian Petroleum Production and Exploration Association.

Meeting in person is the preferred method of engagement with stakeholders. However, this was not always possible during 2020 and 2021 due to the COVID-19 pandemic and associated travel restrictions. Therefore, engagement was primarily by phone, videoconference, and email. After the WA Government eased COVID-19 restrictions, follow-up meetings were held with those based in the Kimberley region.

Effective engagement is supported by maps and other information relating to the scope of the referral and the potential environmental risk or impact of the Proposal, when implemented. A feedback form is also provided to stakeholders, so they have the opportunity to formally provide input to the Proposal.

At the time of writing this document, no objections to the Proposal had been raised by consulted stakeholders. On the contrary, the Traditional Owners are keen to see this Proposal implemented.

BNR will continue to inform these stakeholders, other community organisations, government departments and industry bodies about the Proposal and BNR's other activities in the region.

3.4 Engagement throughout the ESD process

Given the nature of the Proposal, and as this assessment is the first of its kind since the moratorium on hydraulic fracturing was lifted in September 2019, BNR has engaged closely with government agencies and decision-making authorities in developing monitoring programs, frameworks and processes that form the basis of this ERD. Table 3-1 summarises the engagements that have occurred since February 2021. Further Stakeholder engagement since 2023 has also been included in Table 3-1.

Table 3-1: Recent engagements with various stakeholders

Stakeholder	Method of engagement	Date of engagement	Summary of engagement
YAC	In person	28 March 2023, YAC Board meeting and AGM	Participation in the meetings and provision of a project update.
EPA Services	Teams meetings	2 Feb 2023 8 Feb 2023 1 Mar 2023 5 July 2023	Discussions on components of draft ERD to be updated and improved, including options to revise DE size and address flora and fauna survey requirements. BNR advised to demonstrate uniformity of vegetation associations to better validate survey results (covering the whole proposed disturbance footprint) and reduce uncertainty.
DWER	In person meeting	12 June 2023	Validation of groundwater monitoring data. BNR advised that data already provided from monitoring bores AB1S, AB1D, VNB4S and VNB4D, plus data from the YG2/18 well, would be acceptable providing drilling and completion data or results from a camera down hole could be provided.
DCCEEW	Teams meeting	10 Aug 2023	Earlier advice from the Commonwealth had been that this project was not required to be referred. BNR has continued to engage with DCCEEW to reiterate that the environmental impacts associated with the Proposal do not result in any direct or indirect mechanisms that would cause a significant impact to matters of NES protected under the EPBC Act.
DoC	Email	5 Sep 2023	Authorisation for data from bore YG2/18 to be disclosed to DWER.
DEMIRS	Teams meeting In person meeting	13 April 2023 19 September 2023	Discussion on project and approval processes.
DoH	Email	03 Jan 2022	BNR requested a brief review of the HHRA that was internally prepared while waiting for the consultant peer review.

Stakeholder	Method of engagement	Date of engagement	Summary of engagement
		10 Jan 2022	DoH responded and agreed with BNR's conclusion that no further HHRA is required.
Shire of Derby-West Kimberley	Email	23 Dec 2021	BNR provided an overview of petroleum activities planned to be undertaken within EP371 in 2022. Offered the opportunity to provide more information should it be required
Blina station pastoralists	Email	23 Dec 2021	BNR provided an overview of petroleum activities planned to be undertaken within EP 371 in 2022. Offered the opportunity to provide more information should it be required
WAC AGM	In Person	6 – 8 Dec 2021	BNR attended the WAC Annual General Meeting BNR discussed various regulatory approvals including Valhalla exploration drilling Program. BNR thanked WAC and YAC for their support during the Heritage Survey. BNR provided an overview of the new Covid Policy. General community sponsorship and future ranger programs and other sponsorship opportunities.
EPA	Email	25 Nov 2021	Formally notified that the subsidiary BNR had changed address and that the parent company had changed name and address.
EPA	Meeting	24 Nov 2021	Discussed ERD structure with EPA Services, including the new EPA ERD and Environmental Management Plan (EMP) guidelines, and the development of the human health risk assessment (HHRA). EPA stated that BNR should address worker accommodation/health and provide justification whether it is in scope of this referral or not. Actions included: • BNR to formally notify the EPA of BNR's address change • BNR to keep the current structure of the ERD, and address the guideline changes where necessary • BNR to arrange peer review of the HHRA • BNR to address worker health.
YAC AGM	In Person	22 – 24 Nov 2021	BNR attended the YAC Annual General Meeting and discussed various regulatory approvals including the Valhalla exploration drilling program. BNR thanked YAC for their support during the Heritage Survey. BNR provided an overview of the new Covid Policy. General community sponsorship and future ranger programs and other sponsorship opportunities.
EPA	Email	12 Nov 2021	EPA Services confirmed a HHRA was required and that it should come to one of two outcomes: • identifies health risks, receptors etc. and their mitigation; or • identifies there are no health risks/receptors etc.
Department of Communities	Email	08 Nov 2021	Enquired if the Yungngora Community groundwater bore data for the Poole Sandstone aquifer (provided by the Department) could be made publicly available in the ERD. The Department declined. As an action, BNR have compared the data and instead summarised similarities/differences without disclosing any data.
EPA	Meeting	22 Oct 2021	Discussed ESD progress with EPA Services. No actions arose.
DAWE	Meeting	20 Oct 2021	Provided an update on the referral and provided the results from the flora and fauna survey to confirm that no significant impacts to matters NES would occur as a result of the Proposal. Presented the proposed Odin seismic survey.
DoH	Email	19 Oct 2021	Discussed the requirement for a HHRA. DoH stated that if the Proposal is not within two km (end of lateral extent in all directions) of a potable water source or sensitive receptor, then a HHRA is not needed.

Stakeholder	Method of engagement	Date of engagement	Summary of engagement
EPA	Phone	13 Oct 2021	Discussed progress of the ESD and relevant decision-making authorities to discuss HHRA.
WAC & YAC	In Person	12 – 18 Oct 2021	Part 2 – Cultural, ethnographic and archaeological heritage survey via transects and helicopter by Deep Woods Surveys personnel with YAC & WAC representatives
WAC & YAC	In Person	10 -16 Sep 2021	Part 1 – Cultural, ethnographic and archaeological heritage survey. The survey was completed by Deep Woods Surveys personnel with YAC & WAC representatives
EPA	Phone	08 Jul 2021	Provided comments on EPA's final draft of the ESD.
Department of Planning, Lands and Heritage (DPLH)	Email	18 Jun 2021	Received approval from DPLH for the temporary installation of an air quality monitoring station within an Aboriginal heritage site.
SDWK	Phone	16 Jun 2021	Requested if Shire approval was required for installing traffic monitoring equipment on the gravel Calwynyardah–Noonkanbah Road. Shire confirmed via email that BNR could install the equipment. BNR action included sharing the baseline traffic monitoring with the Shire post-survey.
Blina Station manager	Phone and email	14 Jun 2021	BNR provided locations of proposed air quality monitoring stations for the air quality and GHG monitoring program, prior to site installation that month.
YAC	Email	14 Jun 2021	BNR requested approval to install air quality monitoring stations within the Noonkanbah Station as part of the Valhalla baseline air quality and GHG monitoring program. Approval granted.
Department of Communities	Email	09 Jun 2021	Requested drinking water data from the groundwater bores monitored at the Yungngora Community, to obtain information from the deeper aquifers.
DWER	Meeting	09 Jun 2021	Continued discussion regarding the proposed groundwater monitoring program. DWER requested that background information on the underlying Poole Sandstone and Grant Group aquifers should be included in the ERD.
YAC Noonkanbah station WAC	In person	7-10 Jun 2021	Provided an update on the Proposal and discussed heritage survey requirements for the Proposal. Discussed ranger program and sponsorship opportunities (including sponsoring local football team)
YAC and WAC	In person	7-10 Jun 2021	Provided an overview of unconventional drilling activities with independent experts, supported a question-and-answer session.
EPA	Phone	04 Jun 2021	Discussed baseline monitoring requirements from the draft ESD and requested to remove the requirement to sample at each well site for a period of 24 months and change to sampling representative control sites for a period of 24 months.
DWER	Phone	03 Jun 2021	Arranged a meeting to discuss DWER's feedback on the proposed Valhalla baseline groundwater monitoring program.
DPLH	Phone	03 Jun 21	Sought advice on the location of a proposed air quality monitoring station on a mythological Aboriginal heritage site (heritage site associated with an Aboriginal myth).
DWER	Email	26 May 2021	Discussed the suitability of the Valhalla baseline groundwater monitoring program, with regard to monitoring control sites only within the Liveringa Aquifer. Questioned that the other deeper aquifers must be discussed.

Stakeholder	Method of engagement	Date of engagement	Summary of engagement
WA Police	Phone	24 May 2021	Confirmed approval to enter the Yungngora Community to stay overnight during COVID-19 restrictions.
Blina Station manager	Phone and email	19 May 2021	BNR discussed the installation of air quality monitoring stations on Blina Station as part of the air quality and GHG baseline monitoring program. Station manager approved the installation of the equipment on Blina Station and suggested providing help to install these.
Noonkanbah Station manager	Phone	13 May 2021	Discussed the availability of bore logs from pastoral bores on the station; unofficial bore logs could be made available. Re-confirmed that BNR could sample water from the pastoral bores by unscrewing pipes or opening taps. Mentioned that access roads and fence line tracks would be graded at the end of May, and mustering activities would commence early June.
EPA	Meeting	05 May 2021	Met the new EPA Chair and discussed the draft EPA-prepared ESD and BNR's response comments.
EPA	Email	27 Apr 2021	EPA requested a meeting with Matthew Tonts (new EPA Chair) to discuss the Valhalla draft ESD.
EPA	Email	27 Apr 2021	Verified the status on EPA Services' processing of the Valhalla Draft ESD.
Bunuba Dawangarri Aboriginal Corporation (BDAC)	Meeting	31 March 2021	BNR mobilised independent experts from a groundwater and technical perspective to present an overview of HFS activities to the board and answer any questions they had.
Blina Station manager	Phone and email	23 Mar 2021	Discussed sampling station bores for the baseline groundwater monitoring program – station accepted. Discussed the availability of a bore log for a bore located on Blina Station. Confirmed that BNR could sample water from that bore by opening the tap.
DWER	Email	22 Mar 2021	Reviewed sampling methodology and locations for baseline control site groundwater monitoring program. Enquired about availability of bore logs and any existing data for any pastoral bores.
Noonkanbah Station manager	Phone and email	08 Mar 2021	Discussed sampling station bores for the baseline groundwater monitoring program – station accepted. Enquired about the availability of bore logs from pastoral bores on the station. Confirmed that BNR could sample water from the pastoral bores.
BDAC	Meeting	17 Feb 2021	BNR met to discuss the project subcommittee, provide an overview of the project and discussed the opportunity for BNR to provide independent experts to provide information in the form of a community session.
EPA	Email	15 Feb 2021	Discussed monitoring frameworks for dust, volatile organic compounds (VOC), and greenhouse gas (GHG) monitoring. EPA enquired about the justification for the monitoring locations.
EPA	Meeting	08 Feb 2021	Discussed next steps with the EPA and to confirm the baseline monitoring frameworks. BNR action included sending the monitoring frameworks to the EPA with the aim of individually engaging with the relevant EPA branches to confirm each monitoring approach.
EPA	Phone	02 Feb 2021	Discussed baseline air quality monitoring. EPA waiting on suitable branch / personnel to review GHG baseline and confirmation of the objectives of air quality studies that have not progressed. Level of assessment likely released over the next week.

4 Object and principles of the EP Act

4.1 Principles

Section 4A of the EP Act establishes the object and principles of the Act. In accordance with the EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2021c), Table 4-1 describes how each of the five principles of the EP Act has been applied to the Proposal.

Table 4-1: Summary of the Proposal against the EP Act principles

Principle	Summary of the Proposal against EP Act principles
1.Precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decision should be guided by:* *a. Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* b. *An assessment of the risk-weighted consequences of various options.*	The Proposal has a disturbance footprint of ~112 ha. Previous detailed and targeted flora and fauna baseline surveys have been undertaken within the Development Envelope and indicate that although conservation significant flora and fauna have the potential to be present, no threatened flora, threatened fauna, or threatened vegetation associations are expected to be impacted. Assessments for all key factors including noise, dust and atmospheric emissions indicate impacts arising from the Proposal are not significant and are manageable by implementing standard mitigation measures and good practice measures. The review of previous HFS data within EP 371 also indicates there is scientific and historic evidence that such activities can be undertaken in a way that will not cause serious or irreversible damage to the environment. BNR plans to leverage this wealth of environmental data and conduct similar studies for the Proposal to demonstrate that these activities can be undertaken safely with minimal impact to the environment. As part of its commitment to this principle, BNR commits to undertaking pre-construction flora/fauna surveys to ensure that priority flora or fauna will not be adversely impacted by the Proposal. In addition, groundwater monitoring bores will be installed, and data collected prior to drilling activities commencing. Ongoing monitoring throughout the life of the project (and for an agreed period beyond project cessation) will quickly identify any issues so that mitigation measures can be undertaken.
2. Intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.*	Significant environmental impacts are not expected from the Proposal. The Proposal has minimised environmental disturbance where practicable to ensure the health, diversity and productivity of the environment are maintained. Evaluation of the key environmental factors including human health indicates that impacts arising from the Proposal are not significant and will be manageable by implementing standard mitigation measures and good practice measures. As stated above, pre-construction surveys are planned to ensure that priority flora or fauna will not be adversely impacted by the Proposal, and that local groundwater monitoring will occur well in advance of drilling activities.
3. Principles relating to the improved valuation, pricing, and incentive mechanisms *a. environmental factors should be included in the valuation of assets and services* *b. the polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement* *c. the users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.* *Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.*	Throughout the Proposal development process, environmental factors have been considered during decision-making and design. For example, the disturbance footprint has been reduced to ALARP. In siting the final well locations, BNR has considered impacts to fauna and stakeholders The emissions and wastes arising from the Proposal have been identified and plans put into place to manage them. BNR acknowledges that the cost associated with managing these emissions and wastes forms part of the Proposal. Justification for the Proposal includes incentives to balance impacts of emissions by promoting and contributing to increased economic activity and benefits in the region. BNR believes that programs such as these are particularly important for developing the West Kimberley region as unconventional resources occur away from main regional towns, in areas where meaningful employment opportunities are central to addressing economic disadvantages.

Principle	Summary of the Proposal against EP Act principles
4. Conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The areas of vegetation to be disturbed are representative of the surrounding vegetation associations and the wider bioregion. Historical and recent detailed and targeted flora and fauna baseline surveys have been undertaken within the Development Envelope and indicate no threatened flora, fauna, or vegetation associations are likely to be impacted. The whole area of the proposed surface disturbance footprint has been recently surveyed and the disturbance footprint is also fixed at the proposed locations (Figure 1-2). BNR does not seek flexibility in the proposed disturbance footprint under this Proposal. In addition, further pre-construction surveys are planned be undertaken to ensure priority flora or fauna will not be adversely impacted by the Proposal. A focused evaluation on groundwater has been undertaken. This included a review of previous HFS data within EP 371, which indicates the Proposal will not threaten biological diversity or ecological integrity.
5. Waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	Key waste streams have been evaluated and management techniques identified to minimise environmental impacts through appropriate site planning to ensure minimal impact from potential flooding and waste disposal to licensed facilities (Section 2.6).
Description of how the object of the EP Act has been considered The object of the EP Act is 'to protect the environment of the State', having regard to the five principles outlined above. BNR has considered and/or addressed each of the principles in regard to the Proposal and has therefore considered the object of the EP Act.	

4.2 Environmental factors and objectives

The EPA has defined 14 environmental factors and respective objectives, organised into five themes: Sea, Land, Water, Air, and People.

With respect to the Valhalla Gas Exploration and Appraisal Program, and in accordance with the ESD, BNR has classified each environmental factor as either 'key' or 'not applicable' (Table 4-2), where:

- 'key environmental factors' are those parts of the environment that may be impacted by an aspect of the Proposal
- 'not applicable' are those parts of the environment that are not relevant to any aspect of the Proposal.

The assessment of potential environmental impacts focuses on the key environmental factors identified in the ESD, which are further discussed in Sections 5.1 to 5.9.

Table 4-2: Identification of key environmental factors for the Proposal

Factor	Classification of factor	Further information
Theme: Sea		
Benthic communities and habitats	Not applicable	Not applicable
Coastal processes	Not applicable	Not applicable
Marine environmental quality	Not applicable	Not applicable
Marine fauna	Not applicable	Not applicable
Theme: Land		
Flora and vegetation	Key environmental factor	Section 5.1
Landforms	Not applicable	Not applicable
Subterranean fauna	Key environmental factor	Section 5.9
Terrestrial environmental quality	Key environmental factor	Section 5.2
Terrestrial fauna	Key environmental factor	Section 5.3
Theme: Water		
Inland waters	Key environmental factor	Section 5.4
Theme: Air		

Factor	Classification of factor	Further information
Air quality	Key environmental factor	Section 5.6
Greenhouse gas emissions	Key environmental factor	Section 5.7
Theme: People		
Human health	Key environmental factor	Section 5.8
Social surroundings	Key environmental factor	Section 5.5

5 Key environmental factors and objectives

5.1 Flora and vegetation

5.1.1 EPA objective

To protect flora and vegetation so that biological diversity and ecological integrity are maintained.

5.1.2 Legislation, policy, and guidance

- *Environmental Protection Act 1986* (WA)
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act; Commonwealth)
- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Biosecurity and Agriculture Management Act 2007* (WA)
- *Bush Fires Act 1954* (WA)
- Bush Fires Regulations 1954
- Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b)
- Environmental Factor Guideline Flora and Vegetation (EPA, 2016c).

5.1.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing and procedure of the environmental review, as required by Section 40(3) of the EP Act. Table 5-1 lists the ESD requirements specific to flora and vegetation.

Table 5-1: ESD checklist – flora and vegetation

Flora and vegetation		
Required work		**BNR response**
30	Identify and characterise the flora and vegetation of areas that may be directly or indirectly impacted by the Proposal in accordance with *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*. Surveys should be designed to inform local and regional context. Specimens of significant flora collected during surveys should be vouchered at the WA Herbarium.	Appendix C Section 5.1.3
31	Demonstrate how surveys are relevant, representative, and demonstrate consistency with current EPA policy and guidance. Ensure database searches and taxonomic identifications are up to date. If multiple surveys have been undertaken to support the assessment, a consolidated report should be provided including the integrated results of the surveys. All surveys should be appended to the environmental review documentation.	Appendix C Section 5.1.3
32	Provide a figure depicting survey effort applied in relation to the study area and Development Envelope, identifying the direct and indirect impact areas.	Figure 5-1
33	Determine whether any flora species recorded are significant, and provide an analysis of local and regional context, (refer to *Environmental Factor Guideline – Flora and Vegetation* for definition of significant flora).	Section 5.1.3.6 Section 5.1.3.6
34	Determine whether any vegetation identified is significant, and provide an analysis of local and regional context, (refer to *Environmental Factor Guideline – Flora and Vegetation* for definition of significant vegetation).	Section 5.1.5.1
35	Provide figures depicting the recorded locations of flora and vegetation in relation to the Development Envelope in accordance with *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*.	Figure 5-2 Appendix C
36	Assess the potential direct and indirect impacts of the construction and operational elements of the Proposal on identified environmental values. Describe and assess the extent of cumulative impacts as appropriate.	Section 5.1.5 Section 7.3

Flora and vegetation		
Required work		**BNR response**
37	Provide a quantitative assessment of impact: For significant flora, this includes: i. number of individuals and populations in a local and regional context ii. numbers and proportions of individuals and populations directly or potentially indirectly impacted iii. numbers/proportions/populations currently protected within the conservation estate (where known). For all vegetation units (noting threatened and priority ecological communities and significant vegetation) this includes: i. area (in hectares) and proportions directly or potentially indirectly impacted ii. proportions/hectares of the vegetation unit currently protected within conservation estate (where known).	N/A refer to Section 5.1.5.1
38	Describe the application of the mitigation hierarchy in the Proposal design, construction, operation, and decommissioning. Detail actions undertaken to avoid, minimise, and mitigate Proposal impacts. If any conservation significant species are expected to be impacted include management and/or monitoring plans to be implemented pre- and post-construction to demonstrate that residual impacts are not greater than predicted.	Section 5.1.6 N/A
39	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (page 11) and Western Australian Offsets Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014) and include reference to the Commonwealth Assessment Guide for any MNES.	Section 5.1.7 Section 5.11
40	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the *WA Environmental Offsets Policy* (2011) and *Guidelines* (2014). Spatial data defining the area of significant residual impacts for each environmental value should also be provided (e.g. vegetation type, vegetation condition, specific fauna species habitat).	Section 5.1.7 Section 5.11
41	Demonstrate how the EPA's objective for this factor has been addressed.	Section 5.1.7

5.1.3 Receiving environment

The flora and vegetation composition of the Development Envelope is well understood from the numerous surveys that were conducted for previous petroleum activities within EP 371 as well as the surveys undertaken specifically for this Proposal.

Note, the surveys undertaken specifically for this Proposal cover the whole of the proposed surface disturbance footprint. The disturbance footprint is also fixed at the proposed locations (Figure 1-2) and BNR does not seek flexibility in the proposed disturbance footprint under this Proposal.

Table 5-2 lists the flora and vegetation studies relevant to the Proposal. The location of all survey efforts is shown in Figure 5-1, with the location of any significant flora species (including species no longer listed) identified from all previous surveys shown in Figure 5-2. The reports of all baseline studies confirmed that the surveys were designed and conducted in accordance with the relevant technical EPA sampling and survey guidance.

The most recent flora and vegetation survey conducted specifically for the proposed well sites, access tracks, and camp locations within the Development Envelope is attached in Appendix C. It should be noted that the commissioned survey was completed as a detailed and targeted level survey in accordance with the EPA technical guidance. As noted by Eco Logical regarding the limitations of the survey, some areas were inaccessible. However, based upon the number of historic studies completed within the Development Envelope, and a detailed post-survey flora likelihood of occurrence assessment, Eco Logical believes that the level of survey effort was suitable and in line with the EPA guidelines as no Threatened flora species are considered as being likely or having the potential to occur.

As detailed within the EPA Guidelines, a targeted survey is not required where areas are considered as having well defined flora and vegetation values and are not considered likely to support significant flora or vegetation species. BNR believes that based upon the survey effort to date and high confidence in the data, no additional survey effort is required to support the assessment of environmental impacts.

Table 5-2: Baseline studies – flora and vegetation

Author	Report	Distance to Development Envelope	Significant flora	Significant ecological communities	Declared pests / WoNS
(Eco Logical Australia, 2021)	Valhalla Flora and Fauna Survey	Within the Development Envelope – survey specifically undertaken for the Valhalla Gas Exploration and Appraisal Program	*Nymphoides beaglensis* (P3) found on seasonally inundated depressions – outside the Proposal's disturbance footprint	Nil	*Calotropis procera*
(Low Ecological Services, 2020)	Flora and Fauna Assessment – Odin 2D and 3D seismic survey, Fitzroy Basin, Western Australia	Within and immediately surrounding the Development Envelope	Nil	Nil	*Calotropis procera*
(Eco Logical Australia, 2018)	Valhalla Central 4 Flora and Fauna Survey	Within Development Envelope along creek line	Nil	Nil	Nil
(Eco Logical Australia, 2016)	Level 1 Vegetation, Flora and Fauna Survey of Kurrajong, Yakka Munga, and Valhalla Central Well Sites	Valhalla Central A is the only site within Development Envelope	*Pterocaulon intermedium* (no longer listed)	Nil at Valhalla Central A	Nil
(Murdoch University, 2016)	Targeted bilby survey of proposed well site 'Valhalla Central', and immediate area	Within Development Envelope, central	Nil	Nil	Nil
(Buru Energy and Outback Ecology, 2014)	Ophir, Paradise, Valhalla, Eden, and Ellendale Flora, Vegetation and Fauna Survey Report	Adjacent, to the west	Nil	Nil	Nil
(Low Ecological Services, 2012a)	Asgard-1 Exploration Well: Flora, Vegetation and Fauna Survey	Within Development Envelope	Nil	Nil	Nil
(Low Ecological Services, 2012b)	Asgard 2D Seismic Survey: Flora, Vegetation and Fauna Survey	Similar if not overlapping	*Trianthema kimberleyi* (P1), *Goodenia virgata* (P2)	Nil	Nil
(Low Ecological Services, 2011a)	Flora and Vegetation Survey: Valhalla North	Adjacent to the northwest, ~2 km away from the Development Envelope	Nil	Nil	*Calotropis procera*
(Low Ecological Services, 2012b)	Valhalla East-1 Exploration Well: Flora and Fauna Survey	Within Development Envelope, centre north, about 5 km south from northern extent	Nil	Nil	Nil
(Woodman Environmental Consulting, 2007)	Valhalla – 01 Well Site Flora and Vegetation Survey	Within Development Envelope to the northwest	*Goodenia byrnesii* (P1), *Triodia acutispicula* (P3), *Goodenia sepalosa* var. *Glandulosa* (P3)	Nil	Nil

Notes:

P1, P2, P3 = Priority species level

WoNS = Weeds of National Significance

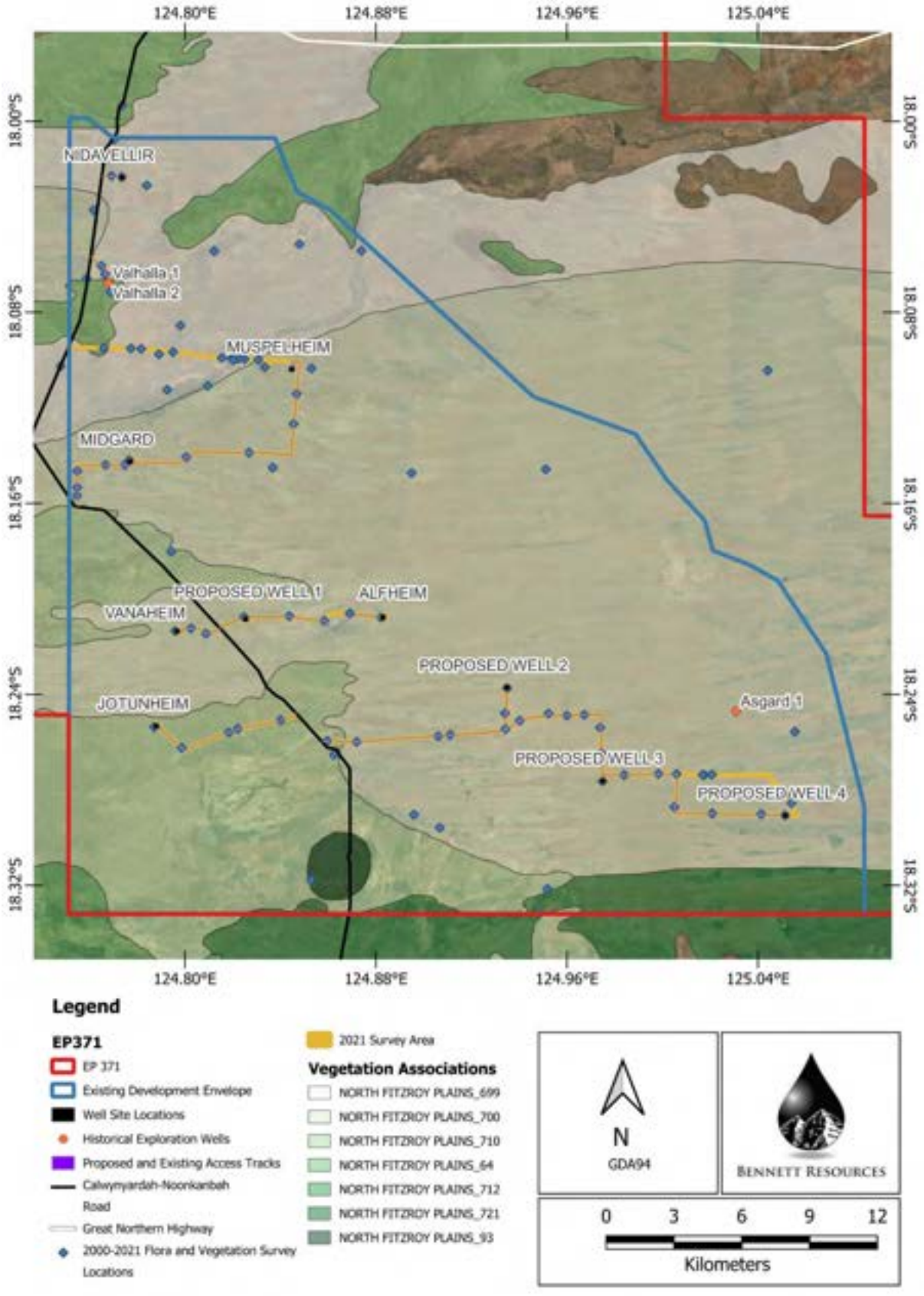

Figure 5-1: Location of flora survey efforts within and surrounding the Development Envelope

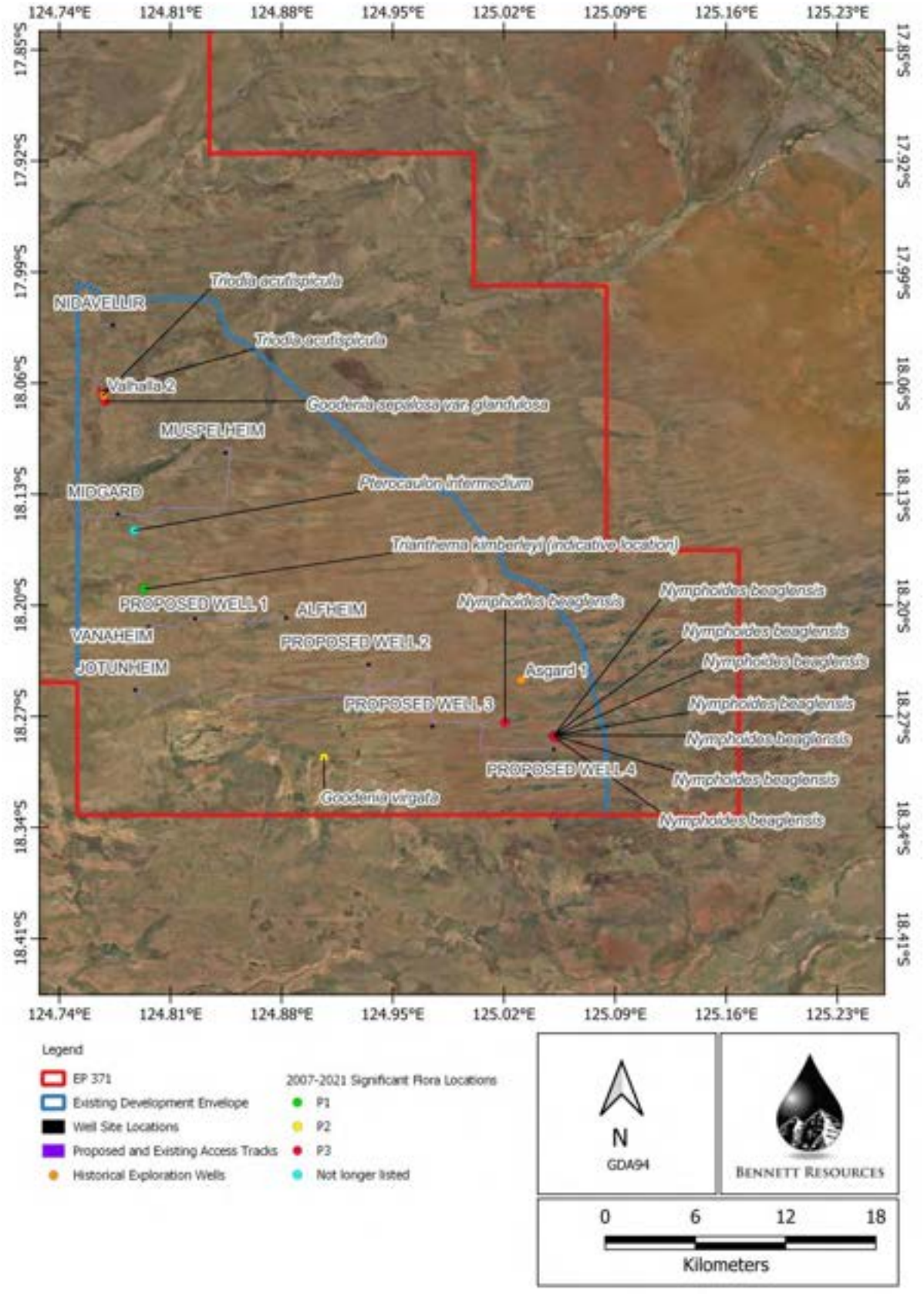

Figure 5-2: Location of previously recorded listed flora species within and surrounding the Development Envelope. Some species are no longer listed–refer to Table 5-2

5.1.3.1 Regional biogeography

The Proposal is located within the West Kimberley's Dampierland Interim Biogeographic Regionalisation for Australia (IBRA) bioregion (DAWE, 2021a).

The Dampierland bioregion is dominated by sand sheets and sandy rises, occasionally dissected by alluvial and lacustrine features associated with surface waters. Its vegetation is relatively uniform and characterised by the Pindan assemblage that develops on sandplains. Acacia thickets with scattered trees, areas of grassland, and savannas (Bastin & ACRIS Management Committee, 2008) are present on these extensive plains, rangelands, and gorges. In the West Kimberley region, rangelands, or areas of open country used for cattle grazing or animal hunting by Traditional Owners, are the dominant ecosystems.

The Development Envelope occurs within the Fitzroy Trough (Dampierland DAL1) IBRA subregion (Figure 5-3), which is located in the semi-arid northern edge of the Canning Basin containing the middle and lower catchments of the Fitzroy River. The Fitzroy Trough comprises Quaternary alluvial plains from the river that are associated with Permian and Mesozoic sediments. These sediments support *Eucalyptus microtheca* and *Lysiphyllum cunninghamii* tree savannas over *Chrysopogon-Dichanthium* grasslands with scattered riparian forests of River Red Gum (*Eucalyptus camaldulensis*) and Cadjeput (*Melaleuca spp*.) along fringe drainage lines. The subregion also includes sandplains and eroded dune surfaces derived from the Canning Basin. Devonian limestones are present in the north and east of the Fitzroy Trough supporting tree steppes with understoreys of *Triodia intermedia* and *T. wiseana* hummock-grass (Graham, 2001; McKenzie, May, & McKenna, 2003).

The Development Envelope is located within the Valhalla province, a colloquial term used to describe the area that lies along the northeastern flank of the Fitzroy Trough where the targeted Laurel Formation shows promise of hydrocarbons at depths between 2,000 m and 4,000 m below ground. The Valhalla province is located within the dune areas outside the floodplains, with the Fitzroy River located approximately 16 km south of the Development Envelope.

5.1.3.2 Conservation areas

The Development Envelope does not intersect any conservation areas (Figure 5-3).

5.1.3.3 Environmentally sensitive areas

An Environmentally Sensitive Area (ESA) is defined as a landscape element or place that is vital to the long-term maintenance of biological diversity, soil, water, or other natural resources. An ESA is declared under Section 51B of the EP Act. The nearest ESA is the Camballin Floodplain, approximately 27 km west of the Development Envelope, which is associated with a nationally important wetland—Le Lievre Swamp (Iljamalkarda) (DEC, 2009). The Lievre Swamp is listed in the Directory of Important Wetlands (DoIW) and was nominated for listing as a wetland of international significance under the Ramsar Convention (Jaensch & Watkins, 1999). This wetland is a major breeding area for waterbirds and a migration stopover area for shorebirds. The floodplain is contiguous with the Fitzroy River floodplain.

To date, flora and vegetation surveys undertaken within the Development Envelope have not identified the presence of any Declared Rare Flora (DRF), Threatened Ecological Communities (TEC), or Priority Ecological Communities (PEC) (Table 5-2). Figure 5-3 depicts the regional environmental values and sensitivities surrounding the Development Envelope.

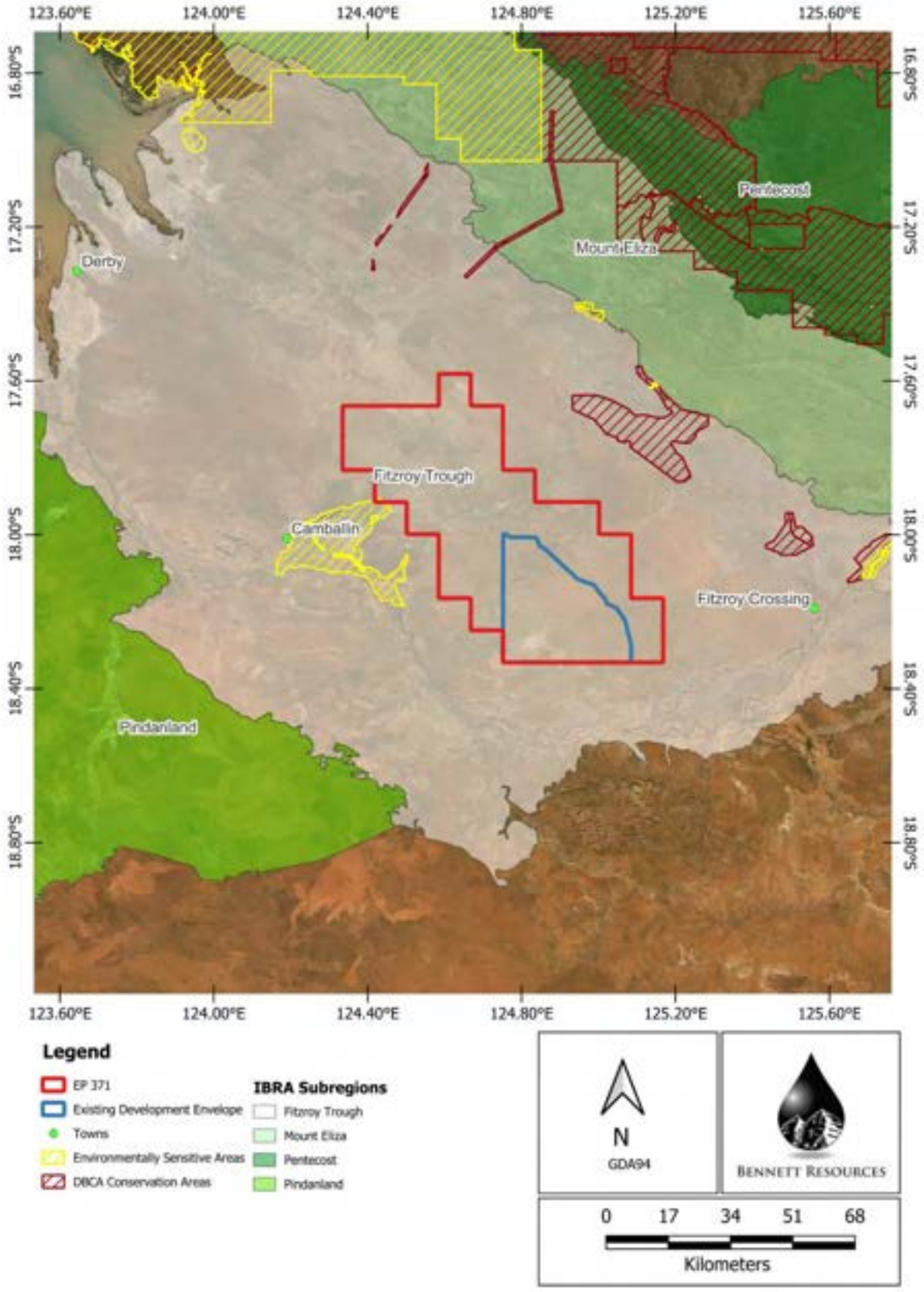

Figure 5-3: IBRA subregions and environmental values of the Kimberley

5.1.3.4 Vegetation associations

Within the Dampierland bioregion, the vegetation is characterised by the Pindan assemblage that occurs on sandplains. Vegetation on Pindan plains is relatively uniform with the same species occurring in very predictable patterns. Pindan is described as a 'grassland wooded by a sparse upper layer of trees and a dense, thicket-forming middle layer of unarmed, phyllodal Acacia' (Beard J. , 1979).

Based upon Beard (Beard J. , 1979) and Shepherd et al. (Shepherd, Beeston, & Hopkins, 2002), four predominant vegetation associations are present within the Development Envelope, as shown in Figure 5-1.Detailed flora and vegetation surveys undertaken within the Development Envelope have verified that the vegetation within the Development Envelope reflects these associations (Table 5-2).

Eco Logical delineated and mapped a total of 13 vegetation communities within the project area (Figure 5-4 and Appendix C). The vegetation code, description and extent within the disturbance footprint is detailed in Table 5-3.

Table 5-3: Local Scale Vegetation associated within the disturbance footprint, as detailed by Eco Logical

Vegetation code	Description	Extent (ha) within the disturbance footprint (% total)
AgCgEc	*Adansonia gregorii* mid isolated trees and *Corymbia greeniana, Erythrophleum chlorostachys, Bauhinia cunninghamii* low open woodland over *Acacia colei, Grevillea pyramidalis, Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low open hummock grassland and *Sorghum plumosum, Chrysopogon fallax* tall open tussock grassland.	11.44 (10.18)
EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Corchorus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.	1.15 (1.02)
CgAgBc	*Corymbia greeniana*, *Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei*, *Hakea arborescens*, *Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa*, *Aristida hygrometrica* low sparse grassland.	14.24 (12.66)
CbEc	*Corymbia bella*, *Eucalyptus coolabah* mid open woodland over *Acacia colei*, *Lophostemon grandiflorus* subsp. *riparius*, *Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica*, *Eriachne obtusa* low sparse grassland.	1.77 (1.58)
CgCzBc	*Corymbia greeniana*, *Corymbia zygophylla*, *Bauhinia cunninghamii* low open woodland over *Acacia platycarpa*, *Grevillea pyramidalis*, *Atalaya hemiglauca* tall sparse shrubland over *Sorghum plumosum*, *Sorghum stipoides* tall open tussock grassland and *Aristida latifolia* mid sparse tussock grassland.	11.33 (10.07)
AgBc	*Adansonia gregorii* mid isolated trees and *Bauhinia cunninghamii* low open woodland over *Grevillea pyramidalis*, *Hakea arborescens*, *Hakea macrocarpa* tall sparse shrubland over *Indigofera colutea* low sparse shrubland, *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa* low sparse grassland.	12.35 (10.98)
BcCg	*Bauhinia cunninghamii*, *Corymbia greeniana* low open woodland over *Hakea macrocarpa*, *Grevillea pyramidalis*, *Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.	3.3 (2.94)
BcTc	*Bauhinia cunninghamii*, *Terminalia canescens* low open woodland over *Grevillea pyramidalis*, *Acacia ancistrocarpa*, *Acacia colei* tall sparse shrubland over *Triodia intermedia*, *Triodia bitextura* low sparse hummock grassland and *Sorghum plumosum* tall open tussock grassland.	7.25 (6.45)
Ag	*Adansonia gregorii* mid open woodland over *Grevillea pyramidalis*, *Hakea chordophylla*, *Dolichandrone occidentalis* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall sparse tussock grassland and *Aristida holathera* low sparse grassland.	9.16 (8.14)
AtAcDo	*Atalaya hemiglauca*, *Acacia synchronicia*, *Dolichandrone occidentalis* tall sparse shrubland over *Carissa lanceolata*, *Gossypium australe*, *Chamaecrista symonii* low sparse shrubland over *Triodia intermedia*, *Triodia wiseana* low hummock grassland and *Eriachne obtusa* low sparse grassland.	12.38 (11.01)

Vegetation code	Description	Extent (ha) within the disturbance footprint (% total)
BcGaCg	*Bauhinia cunninghamii, Gyrocarpus americanus, Corymbia greeniana* low open woodland over *Acacia platycarpa*, *Acacia tumida* tall open shrubland and *Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low sparse hummock grassland and *Aristida hygrometrica*, *Eriachne obtusa* low sparse grassland.	11.45 (10.18)
EcCg	*Erythrophleum chlorostachys, Corymbia greeniana* low open woodland over *Acacia tumida*, *Acacia ancistrocarpa* tall sparse shrubland and *Carissa lanceolata* mid sparse shrubland over *Bonamia pannosa*, *Bonamia linearis* low sparse shrubland and *Aristida hygrometrica* low open grassland.	4.68 (4.16)
CzEcCg	*Corymbia zygophylla*, *Erythrophleum chlorostachys*, *Corymbia greeniana* low open woodland over *Acacia tumida*, *Acacia platycarpa* tall sparse shrubland and *Waltheria indica* low sparse shrubland over *Triodia bitextura*, *Triodia wiseana* low open hummock grassland and *Eriachne obtusa* low sparse grassland.	11.95 (10.63)

None of the vegetation associations present within the Development Envelope were inferred to represent any known or potential conservation significant vegetation communities listed under the EPBC Act, the BC Act, or by the WA Department of Biodiversity, Conservation and Attractions (DBCA) . Eco Logical confirmed that vegetation communities Ag, AgBc, AgCgEc, AtAcDo, BcCg, BcGaCg, BcTc, CgAgBc, CgCzBc, EcCg and EmEcAg broadly comprise aspects of Beard's North Fitzroy Plains 64 and 710 vegetation associations with the presence of mixed hummock (*Triodia* spp.) and tussock grasslands, *Adansonia gregorii, Bauhinia cunninghamii* and ribbon grass (*Chrysopogon fallax)*; (Government of Western Australia 2019).

Eco Logical confirmed that vegetation communities AgCgEc, CbEc, BcTc, BcGaCg, EcCg, CzEcCg broadly comprise aspects of Beard's North Fitzroy Plains 699 and 700 vegetation communities with the presence of shrublands over curly spinifex (*Triodia bitextura*) on sandplain or between dunes (Government of Western Australia 2019).

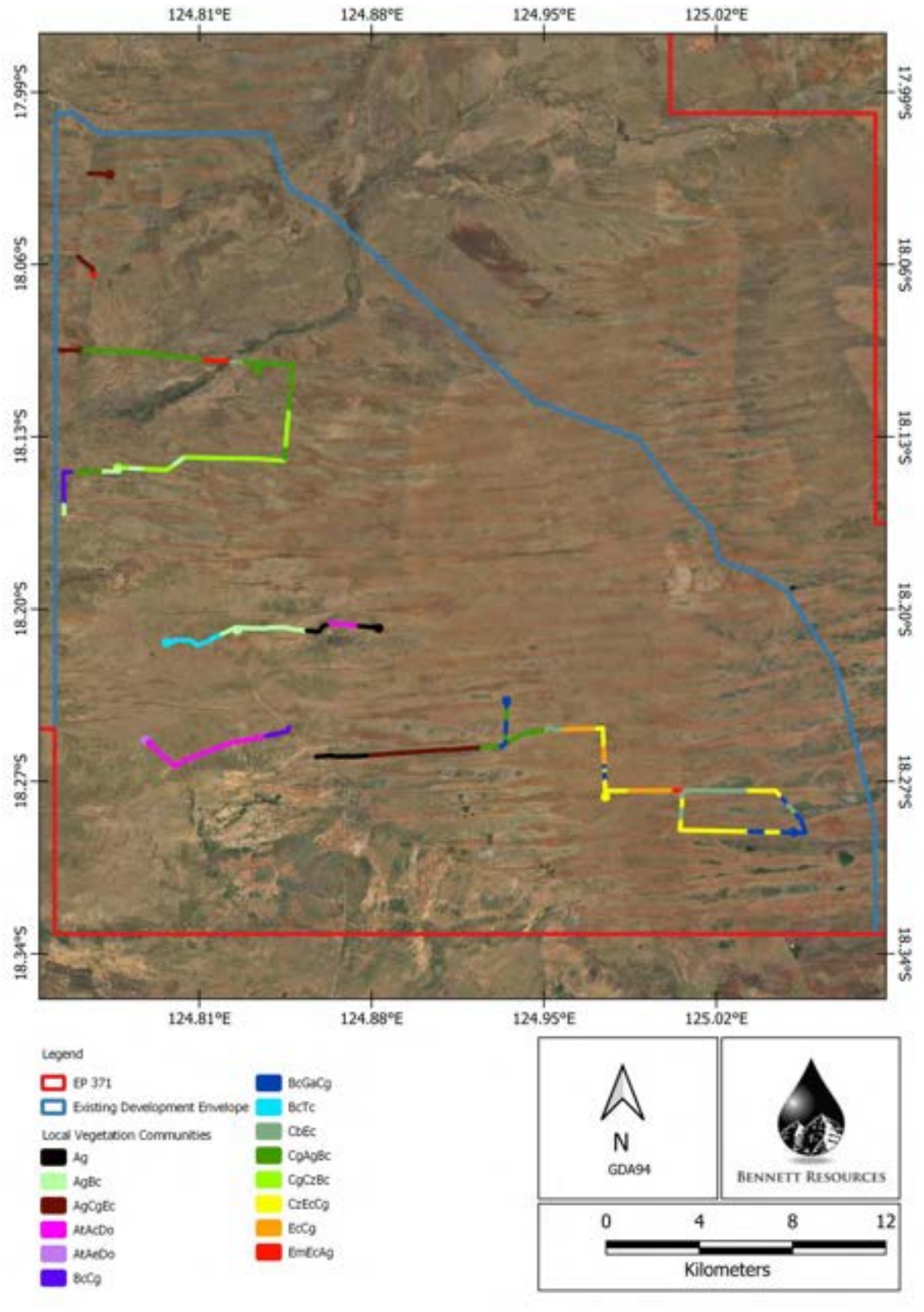

Figure 5-4: Local vegetation communities Eco Logical

To ensure that a sufficient understanding of all vegetation associations present throughout the entire Development Envelope (not just the disturbance footprint) is available, BNR reviewed all known flora surveys conducted within the Development Envelope (Table 5-2). To complete this task, all reports were reviewed and for each survey, the following information was documented:

- spatial survey location
- survey date
- vegetation codes and botanist description.

Where a specific vegetation associated was not provided, the descriptions of vegetation in detailed field notes were used to inform BNR's understanding of the vegetation association. Survey points were then plotted and reviewed against broadscale desktop vegetation communities, along with the 2021 field vegetation survey.

BNR determined that the vast majority of communities could be mapped back to broadscale desktop vegetation community descriptors with only a few exceptions consistent with the findings from Eco Logical . For the exceptions, vegetation communities were either matched to the nearest adjacent broadscale vegetation community (previously identified in the Development Envelope) or considered as part of a broadscale vegetation community adjacent to the Development Envelope (Figure 5-5). A summary of vegetation communities and their presence is included in Table 5-4 and the data is included as Appendix D.

Table 5-4: Extent of the vegetation associations in the Fitzroy Trough IBRA subregion (Government of Western Australia, 2018; Government of Western Australia, 2021a)

Vegetation Association	Flora Description	Pre-European extent (ha) within the subregion	Current extent (ha) within the subregion	Pre-European extent remaining
North Fitzroy Plains_64	Mainly ribbon grass with low woodland or scattered trees e.g. *Eucalyptus terminalis* over *Chrysopogon* spp., *Dichanthium* spp.	410,085.60	409,862.82	99.95%
North Fitzroy Plains_699	Acacia thicket with scattered low trees over spinifex *Acacia eriopoda, Corymbia dichromophloia, Triodia pungens, T. bitextura*	180,118.58	179,963.89	99.91%
North Fitzroy Plains_700	Acacia thicket with scattered low trees over spinifex *Acacia eriopoda, Corymbia dichromophloia, Triodia pungens, T. bitextura*	212,971.66	212,971.66	100.00%
North Fitzroy Plains_710	Curly spinifex or short grass low tree savanna / Grass-steppe	25,596.64	25,596.64	100.00%
North Fitzroy Plains_712	Curly spinifex or short grass low tree savanna / Grass-steppe	232,040.19	232,040.19	100.00%
North Fitzroy Plains_721	Hummock grassland with sparse Eucalypts e.g. bloodwoods and snappy gum *Triodia* spp., *Corymbia dichromophloia, C. opaca, Eucalyptus leucophoia*	51,884.13	51,884.13	100.00%
North Fitzroy Plains_93	Hummock grassland with scattered shrubs or mallee *Triodia* spp. *Acacia* spp., *Grevillea* spp. *Eucalyptus* spp	975.61	975.61	100.00%

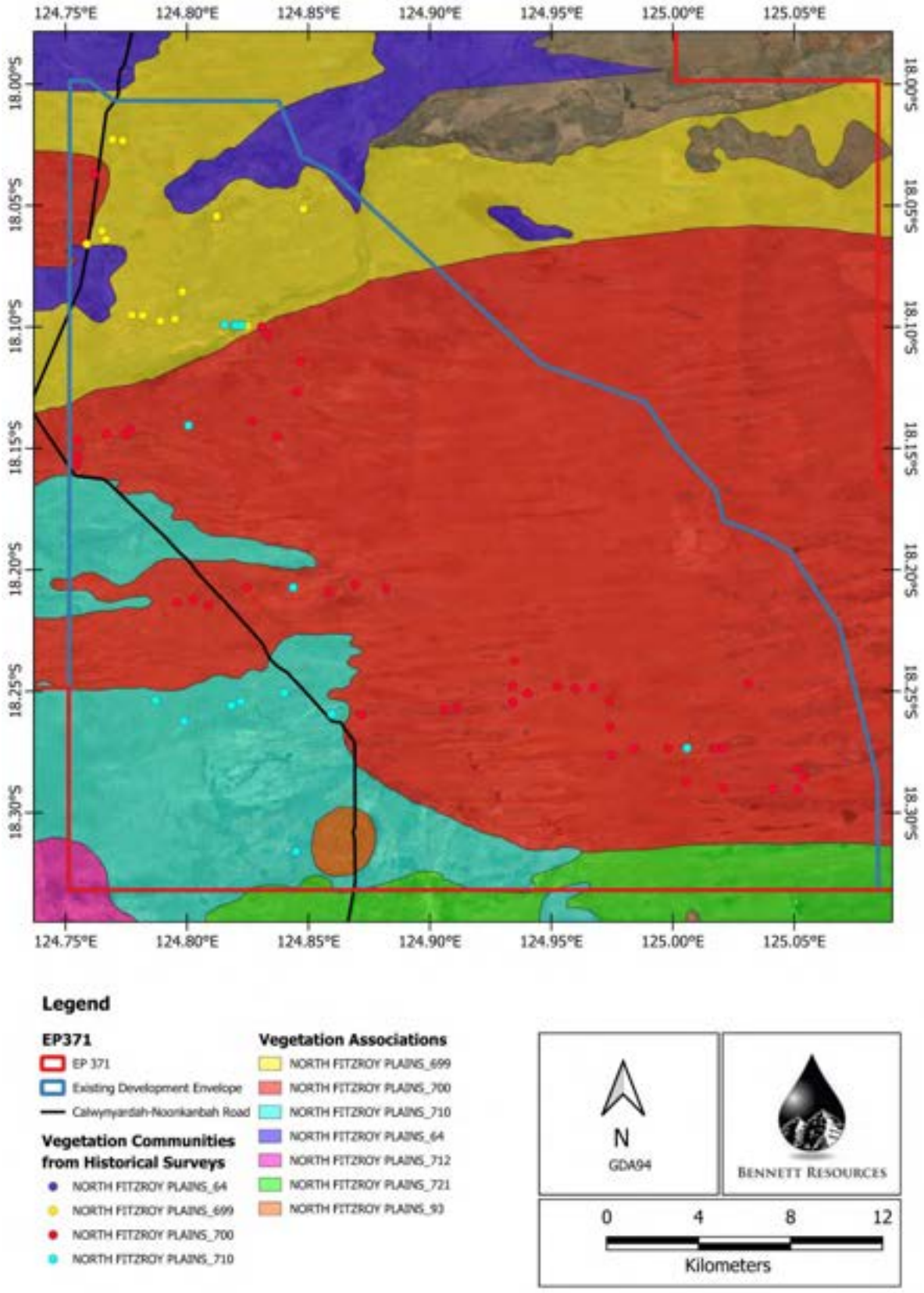

Figure 5-5 Desktop analysis of historical surveys and analysis of all vegetation associations within the Development Envelope

5.1.3.5 Threatened / Declared Rare Flora

Flora species that have been formally recognised as Threatened or DRF are protected under State legislation under Part 2 of the BC Act, and under Commonwealth legislation under the EPBC Act. A desktop search of DBCA's NatureMap and of DAWE's Protected Matters Search Tool (PMST) database identified no Threatened or DRF species to be present within a five km buffer around the Development Envelope. This has been validated by earlier and recent flora and vegetation surveys conducted within the Development Envelope, revealing that no Threatened or DRF species have been identified in the surrounding region.

5.1.3.6 Priority flora

A desktop search of NatureMap identified only *Goodenia byrnesii* (P3) within a five km buffer around the Development Envelope. Flora and vegetation surveys conducted within the Development Envelope identified six Priority flora species known to occur within the Development Envelope:

- *Goodenia byrnesii* (P3)
- *Goodenia sepalosa* var. *glandulosa* (P3)
- *Goodenia virgata* (P2)
- *Nymphoides beaglensis* (P3)
- *Trianthema kimberleyi* (P1)
- *Triodia acutispicula* (P3).

Of the 35 conservation significant flora species identified from the pre-survey likelihood of occurrence assessment completed by Eco Logical , and the six species previously recorded within the Development Envelope, a single Priority listed species was recorded within the Disturbance Footprint; *Nymphoides beaglensis* (P3). A summary of the locations and number of individuals is provided in Table 5-5. Based on the post-survey likelihood of occurrence assessment, *Goodenia byrnesii* (P3) and *Goodenia sepalosa var. glandulosa* (P3) were identified as being likely to occur within the Project Area given historical records. However, as no individuals were recorded during the survey, and as no historic records were located within the Disturbance footprint the potential impact to this species is considered limited.

Species identification utilised taxonomic literature and keys and where required specimens were confirmed using the WAH reference collection.

Table 5-5: Location of *Nymphoides beaglensis*

EPBC Act	BC Act	Species Name	Date	Quadrat	Easting	Northing	# plants	Pop area (m)
-	P3	*Nymphoides beaglensis*	07/3/2021	ELA57	713276	7978347	50	2500
-	P3	*Nymphoides beaglensis*	07/3/2021	ELA58	713620	7978355	1	2500
-	P3	*Nymphoides beaglensis*	04/3/2021	ELA64	716838	7977401	20	2500
-	P3	*Nymphoides beaglensis*	-	Oppo	716841	7977397	5	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716855	7977389	10	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716869	7977387	14	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716855	7977367	11	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716872	7977362	1	-

5.1.3.7 Range Extension

Eco Logical identified four species within the project area as representing range extensions (RE), namely *Cajanus latisepalus*, *Lindernia chrysoplectra*, *Lindernia clausa* and *Tephrosia remotiflora*.

Cajanus latisepalus is currently known from 60 records in WA, over a range of approximately 500 km from Meda in the west across to the Northern Territory (NT) border in the east (DBCA 2007-2021). Within the project area, this species was recorded from one quadrat location; ELA29, within the AgBc vegetation

community on moist light brown clay loam flats. This record represents a minor range extension of approximately 60 km to the southwest of the known range of this species.

Lindernia chrysoplectra is currently known from 12 records in WA, over a range of approximately 465 km from the Dampier Peninsula in the northwest to 180 km west of Sturt Creek in the southeast (DBCA 2007-2021). Within the project area, this species was recorded from one quadrat location; ELA64, within the CbEc vegetation community on waterlogged dark brown sandy clay on open depression. This record represents a range infill, joining the eastern and western populations of this species, with the closest records of this species approximately 170 km to the west and 150 km to the east-southeast of the project area.

Lindernia clausa is currently known from 22 records in WA, over a range of approximately 675 km from the Dampier Peninsula in the southwest to near Kununurra in the east (DBCA 2007-2021). Within the project area, this species was recorded from three quadrat locations; ELA26, ELA27 and ELA31, within the BcTc and Ag vegetation communities on moist brown clay on open depression. This record represents a range extension of approximately 112 km to the south of the known range of this species.

Tephrosia remotiflora is currently known from 53 records in WA, over a range of approximately 1,795 km from near Onslow in the south Kununurra and into the NT in the north (DBCA 2007-2021). Within the project area, this species was recorded from one quadrat location; ELA01, within the AgCgEc vegetation community on red brown sandy loam on a gentle slope. This record represents a minor range extension of approximately 65 km to the south of the known range of this species.

As all species with range extensions were classified as grasses, individuals were not counted. However, percentage cover was recorded. The locations of the percentage cover of these species for the recorded quadrat is provided in Table 5-5.

Table 5-6: Location of species with identified range extension

EPBC Act	BC Act	Species Name	Quadrat	Easting	Northing	% cover
-	-	*Cajanus latisepalus*,	ELA29	692961	7985886	2
-	-	*Lindernia chrysoplectra*,	ELA64	716838	7977401	.01
-	-	*Lindernia clausa*	ELA26	689918	7985266	.01
-	-	*Lindernia clausa*	ELA 27	690616	7985383	.01
-	-	*Lindernia clausa*	ELA 31	696524	7985668	.05
-	-	*Tephrosia remotiflora*	ELA01	687296	8006395	0.2

5.1.3.8 Introduced and invasive species

The DAWE PMST desktop search identified that three weed species potentially occur within a five km buffer around the Development Envelope; these are:

- *Cenchrus ciliaris* (Buffel grass)
- *Jatropha gossypifolia* (Cotton-leaved Physic-nut, Bellyache bush)
- *Parkinsonia aculeata* (Parkinsonia, Jerusalem Thorn) – Declared Pest.

Historical and recent on-ground flora surveys undertaken in the Valhalla province (Table 5-2) identified these species as being present within the Development Envelope:

- *Calotropis procera* (Rubber Bush, Calotrope) – Declared Pest
- *Cenchrus ciliaris* (Buffel grass)
- *Cenchrus setiger* (Birdwood grass)
- *Cucumis* spp. (*C. argenteus* and *C. melo*)
- *Malvastrum americanum* (Spiked Malvastrum)

- *Melochia pyramidata* (Pyramid flower)
- *Portulaca oleracea* (Common Purslane)
- *Portulaca Pilosa* (Pink Purslane)
- *Parkinsonia aculeata* – Declared Pest
- *Sida cordifolia* (Flannel weed)
- Stylosanthes spp. (*S. hamata* and *S. scabra*)
- *Trianthema pilosum*
- *Vachellia farnesiana* (Mimosa bush).

Of all the weeds recorded, *Parkinsonia aculeata* has been declared as a Weed of National Significance (WoNS). Both *Parkinsonia aculeata* and *Calotropis procera* are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (WA).

5.1.4 Potential impacts

A summary of the potential impacts associated with the Proposal is provided below.

5.1.4.1 Direct impacts

The Proposal will cause this direct impact to vegetation and flora:

- loss and fragmentation of native vegetation from clearing.

5.1.4.2 Indirect impacts

The Proposal may cause these indirect impacts to vegetation and flora:

- degradation or loss of vegetation ecology and biodiversity as a result of the introduction of non-indigenous species (weeds)
- degradation or loss of vegetation ecology and biodiversity as a result of an unplanned fire event
- degradation or loss of vegetation ecology and biodiversity as a result of dust.

5.1.5 Assessment of Impacts

5.1.5.1 Loss and fragmentation of native vegetation from clearing

The Proposal will result in a direct loss of native vegetation and flora as a consequence of clearing to construct well sites, required access tracks and some worker camps. Table 5-5 summarises the proposed clearing areas and their vegetation associations.

Table 5-7: Proposed clearing areas and vegetation associations

Vegetation association	Current extent (ha) within the subregion	Clearing (ha)	Impact of clearing at a regional scale
North Fitzroy Plains_699	179,963.89	~5	~0.0028%
North Fitzroy Plains_700	212,971.66	~86	~0.04%
North Fitzroy Plains_710	25,596.64	~14	~0.054%
TOTAL	**418,532.19**	**~105**	

5.1.5.1.1 Regional significance

The direct impact of clearing is limited to no more than 0.054 per cent of a single broadscale vegetation association. Having regard to the extent and distribution of these systems regionally, the loss of 0.054 per cent of a vegetation association is not considered to be significant at a regional scale.

The vegetation associations within the Development Envelope are well represented locally. Figure 5-1 shows the extent of the pre-European vegetation associations present within and surrounding the Development Envelope. The seven vegetation associations identified within the Development Envelope are present in and adjacent to EP 371. Mapping of other vegetation systems outside EP 371 show similarities in the types of vegetation present (Beard, Beeston, Harvey, Hopkins, & Shepherd, 2013). This reflects the domination of Pindan vegetation, which is found throughout the West Kimberley region, and also reflects previous surveys undertaken at various locations within EP 371 (Table 5-2 and Figure 5-1) and confirmed with the recent desktop analysis. With the small scale and low impact of the Proposal, the loss of vegetation within the well site locations, the access tracks and worker camps are not considered to result in significant local or regional impacts.

Additionally, the loss of vegetation associated with the Proposal is not expected to result in fragmentation effects. As detailed in Section 5.1.3.4, vegetation associations within the region are widespread and well represented. As the well sites are geographically separated, habitat fragmentation is not expected on a regional scale. Fragmentation impacts (if any) would only be highly localised to each well site. Fragmentation in relation to cumulative impacts from the Proposal is further detailed in Section 6.

5.1.5.1.2 Local Significance

Vegetation associations that are rare, but not currently threatened or have insufficient information available to be listed as a Threatened Ecological Community (TEC) are designated as a Priority Ecological Community (PEC). Having regard to the vegetation survey completed by Eco Logical , 13 vegetation associations were identified as being present. None of the vegetation associations present within the Development Envelope were inferred to represent any known or potential conservation significant vegetation communities listed under the EPBC Act, the BC Act, or by the WA Department of Biodiversity, Conservation and Attractions (DBCA) .

Vegetation communities mapped within the Project Area align with Beard's vegetation association mapping, as presented in Section 5.1.5.1.1. Vegetation communities Ag, AgBc, AgCgEc, AtAcDo, BcCg, BcGaCg, BcTc, CgAgBc, CgCzBc, EcCg and EmEcAg broadly comprise aspects of Beard's North Fitzroy Plains 64 and 710 vegetation associations with the presence of mixed hummock (Triodia spp.) and tussock grasslands, Adansonia gregorii, Bauhinia cunninghamii and ribbon grass (Chrysopogon fallax; Government of Western Australia 2019). Vegetation communities AgCgEc, CbEc, BcTc, BcGaCg, EcCg, CzEcCg broadly comprise aspects of Beard's North Fitzroy Plains 699 and 700 vegetation communities with the presence of shrublands over curly spinifex (Triodia bitextura) on sandplain or between dunes (Government of Western Australia 2019).

The association with the highest quantity of impact was CgAgBc, comprising 12 per cent of the disturbance footprint or 14 hectares, which is described by Eco Logical to broadly comprise aspects of Beard's North Fitzroy Plains 64 and 710 vegetation associations . Having regard to the extent and distribution of these systems locally, the loss of 0.056 per cent of a local vegetation association is not considered to be significant when compared to availability across the area.

Given that none of the vegetation associations mapped by Eco Logical are considered to be rare, nor do they match communities that have insufficient information available on them, BNR does not believe that the direct impact to each of the local vegetation communities, as detailed by Eco Logical , will result in a significant localised impact.

Vegetation communities recorded within the Project Area are similar to those recorded from previous studies within the region; Low Ecological Services (2012b) recorded a mix of Bauhinia cunninghamii, Adansonia gregorii, Corymbia spp. and Acacia spp. over hummock (Triodia spp.) and tussock grasslands (Aristida, Sorghum) within the Asgard 2D seismic survey area, located adjacent to and within the current Project Area. Low Ecological Services (2020) also recorded similar plant community structure and composition, including low open woodlands (Adansonia gregorii, Bauhinia cunninghamii, Corymbia spp.) and grasslands, riparian communities and low woodland on sand dunes within the Odin 2D and 3D seismic survey area, located adjacent to and within the current Project Area. Woodman Environmental (2007) also recorded a plant community of similar composition (open woodland of Eucalyptus and Corymbia over Aristida and Eriachne tussock grasses) within their Valhalla Well Site survey area.

Table 5-8: Proposed clearing areas and local vegetation associations

Vegetation association	Regional vegetation association	Current extent (ha) within the subregion (regional vegetation association)	Surveyed area (indicative clearing area [ha])	Impact of clearing at a local scale (%)
Ag	North Fitzroy Plains 710 and 64	25,596.64	9.16	0.036
AgBc	North Fitzroy Plains 710 and 64	25,596.64	12.35	0.048
AgCgEc	North Fitzroy Plains 699 and 700	392,935.55	11.44	0.003
AtAcDo	North Fitzroy Plains 710 and 64	25,596.64	12.38	0.048
BcCg	North Fitzroy Plains 710 and 64	25,596.64	3.3	0.013
BcGaCg	North Fitzroy Plains 710 and 64	25,596.64	11.45	0.045
BcTc	North Fitzroy Plains 710 and 64	25,596.64	7.25	0.028
CbEc	North Fitzroy Plains 699 and 700	392,935.55	1.77	0.000
CgAgBc	North Fitzroy Plains 710 and 64	25,596.64	14.24	0.056
CgCzBc	North Fitzroy Plains 710 and 64	25,596.64	11.33	0.044
CzEcCg	North Fitzroy Plains 699 and 700	392,935.55	11.95	0.003
EcCg	North Fitzroy Plains 710 and 64	25,596.64	4.68	0.018
EmEcAg	North Fitzroy Plains 710 and 64	25,596.64	1.15	0.004

5.1.5.1.3 Conservation Significant flora

As described in Table 5-2, many flora and vegetation surveys have been undertaken in and near the Development Envelope. These surveys indicate that Threatened or DRF species are not expected to occur within the Development Envelope. No TEC or PEC, as listed under the BC Act or EPBC Act, are reported to occur within the Development Envelope. Because the areas surveyed are considered indicative and representative of the expected flora and vegetation composition within the Development Envelope, no DRF, TEC, or PEC are expected to be impacted by the Proposal.

As described in Section 5.1.3.6 in the desktop assessment, six Priority species were recorded in the Development Envelope during these surveys:

- *Goodenia byrnesii* (P3)
- *Goodenia sepalosa* var. *glandulosa* (P3)
- *Goodenia virgata* (P2)
- *Nymphoides beaglensis* (P3)
- *Trianthema kimberleyi* (P1)
- *Triodia acutispicula* (P3).

Nymphoides beaglensis (P3) was the only Priority species recorded during the 2021 flora and vegetation survey undertaken for the Proposal (Table 5-5). *Nymphoides beaglensis* (P3) is an annual aquatic herb with white to pink and purple flowers from March to June (DBCA and WAH 2021). It is known from 20 records over a range of approximately 475 km from Roebuck in the southwest to the Mitchell Plateau in the northeast, with the nearest known record located approximately 38 km northwest of the Project Area (DBCA 2007-2021). Surveys in 2021 indicate that the species is prolific in the local area, having been recorded at eight point locations with over 100 records. However, as the Disturbance footprint was realigned to avoid the aquatic and marshy habitat, no direct impacts to any of the recorded species will occur.

Although this species was identified in the original disturbance footprint, BNR modified the disturbance footprint to avoid impacts to this species and its preferred vegetation community—this species is associated

with damp lands, which the Proposal will avoid. The "realignment" was completed whilst botanists were in the field and as such the entire area (including the realignment) was surveyed.

As detailed in Table 5-2 and depicted in Figure 5-2, a summary of all conservation significant flora identified within the Development Envelope, having regard to the disturbance footprint, verifies that no Priority species are expected to be impacted by the Proposal.

As detailed in Section 5.1.3.7, Eco Logical identified four recorded species within the project area as representing range extensions (RE), namely *Cajanus latisepalus*, *Lindernia chrysoplectra*, *Lindernia clausa* and *Tephrosia remotiflora*.

Cajanus latisepalus is an erect, spindly shrub with yellow pea flowers from March to August (DBCA and WAH 2021). It is known to grow in sandy or gravelly soils, sandstone and basalt on sandplains and rocky slopes (DBCA and WAH 2021). Cajanus latisepalus is currently known from 281 records in Australia, over a range of approximately 500 km from Meda in the west across to the Northern Territory (NT) border in the east (ALA, -2023). The species has been recorded across multiple IBRA regions including Central Kimberley, Northern Kimberley, Ord Victoria Plain and Victoria Bonaparte (DBCA, 2021).

This species was only recorded in a single quadrat within the disturbance footprint: ELA29, within the AgBc vegetation community on moist light brown clay loam flats. This record represents a minor range extension of approximately 60 km to the southwest of the known range of this species.

Given its broad distribution, clearing individuals of *Cajanus latisepalus* within a single location within the disturbance footprint is not considered to result in a significant impact to the species as:

- direct impacts to species are limited to a single vegetation community within disturbance footprint (AgBc) which comprises only 12.35 per cent of the disturbance footprint (Table 5-4)
- the taxon has been recorded across a broader number of IBRA regions suggesting any local impacts would not result in population level impacts
- vegetation communities were considered to broadly comprise aspects of broadscale desktop mapping, which themselves are not considered locally restricted. being widespread throughout the region demonstrating that these species will not be restricted to just to the disturbance footprint. Therefore, the Proposal will not affect the broader population.

Lindernia chrysoplectra is currently known from 13 records in WA and NT, over a range of approximately 465 km from the Dampier Peninsula in the northwest to 180 km west of Sturt Creek in the southeast (ALA, -2023a). The species has been recorded across multiple IBRA regions including Dampierland and Ord Victoria Plain (DBCA, 2021). This species was only recorded in a single quadrat within the disturbance footprint; ELA64, within the CbEc vegetation community on waterlogged dark brown sandy clay on an open depression. This record represents a range infill, joining the eastern and western populations of this species, with the closest records of this species approximately 170 km to the west and 150 km to the east-southeast of the project area. Given its broad distribution across multiple IBRA regions, clearing individuals of *Lindernia chrysoplectra* within a single location within the disturbance footprint is not considered to result in a significant impact to the species as:

- direct impacts to species are limited to a single vegetation community within disturbance footprint (CbEc) which comprises only 1.5 per cent of the disturbance footprint (Table 5-3)
- the taxon has been recorded across a broader number of IBRA regions suggesting any local impacts would not result in population level impacts
- vegetation communities were considered to broadly comprise aspects of broadscale desktop mapping, which themselves are not considered locally restricted, being widespread throughout the region. This demonstrates that these species will not be restricted to just to the disturbance footprint. Therefore, the Proposal will not affect the broader population.

Lindernia clausa is currently known from 230 records throughout WA, NT and Queensland over a range of approximately 1500 km (ALA, -2023b). The species has been recorded across multiple IBRA regions including Central Kimberley, Dampierland, Northern Kimberley and Victoria Bonaparte (DBCA, 2021). This species was recorded from three quadrat locations; ELA26, ELA27 and ELA31, within the BcTc and Ag vegetation communities on moist brown clay on open depression. This record represents a range

extension of approximately 112 km to the south of the known range of this species. Clearing individuals of *Lindernia chrysoplectra* within the disturbance footprint is not considered to result in a significant impact to the species as:

- direct impacts to species are limited to two vegetation communities within disturbance footprint (BcTc and Ag) which comprises 14.5 per cent of the disturbance footprint (Table 5-3)
- the taxon has been recorded across a broader number of IBRA regions suggesting any local impacts would not result in population level impacts
- vegetation communities were considered to broadly comprise aspects of broadscale desktop mapping, which themselves are not considered locally restricted, being widespread throughout the region demonstrating that these species will not be restricted to just to the disturbance footprint. Therefore, the Proposal will not affect the broader population.

Tephrosia remotiflora is currently known from 870 records across WA, NT and QLD, over a range of approximately 2,000 km from near Onslow in the south Kununurra to the Queensland coast (ALA, -2023c). The species has been recorded across multiple IBRA regions including Central Kimberley, Dampierland, Northern Kimberley, Ord Victoria Plain, Pilbara and Victoria Bonaparte (DBCA, 2021) This species was recorded from one quadrat location; ELA01, within the AgCgEc vegetation community on red brown sandy loam on a gentle slope. This record represents a minor range extension of approximately 65 km to the south of the known range of this species. Clearing individuals of *Tephrosia remotiflora* within the disturbance footprint is not considered to result in a significant impact to the species as:

- direct impacts to species are limited to two vegetation communities within disturbance footprint (AgCgEc) which comprises 10.8 per cent of the disturbance footprint (Table 5-3)
- the taxon has been recorded across a broader number of IBRA regions suggesting any local impacts would not result in population level impacts
- vegetation communities were considered to broadly comprise aspects of broadscale desktop mapping, which themselves are not considered locally restricted, being widespread throughout the region demonstrating that these species will not be restricted to just to the disturbance footprint. Therefore, the Proposal will not affect the broader population.

Noting that (EPA, 2016c) list other mechanisms in which flora species may be significant, BNR has reviewed this list and on the basis that:

- no threatened or priority species will be impacted
- no locally endemic species or species associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems) will be impacted
- no new species or anomalous features that indicate a potential new species were identified by Eco Logical
- although four species that are representative of range extensions were identified by Eco Logical, on review these species are not spatially restricted with distribution across multiple IBRA regions, states and identified within vegetation communities that are likely present and widespread throughout the Kimberley region
- no unusual species, including restricted subspecies, varieties or naturally occurring hybrids were identified by Eco Logical
- no species of relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape, were identified by Eco Logical.

BNR does not believe that the Proposal poses a risk to significant flora or vegetation values planned to be impacted within the disturbance footprint.

5.1.5.2 Degradation or loss of vegetation ecology and biodiversity as a result of the introduction of non-indigenous species (weeds)

The introduction of non-indigenous species (weeds) is an indirect impact that is a standard risk for projects within and adjacent to native vegetation. Spreading weed species that are already present within the

Development Envelope would be expected to result in short-term effects to ecosystem function. However, the introduction of new weed species to well sites within the Development Envelope has the potential to result in longer term impacts, where the new species out-compete native species, causing local vegetation associations and ecosystems to be significantly altered.

The incidences of spreading weed species around and introducing new weed species to the Development Envelope can be managed through standard mitigation measures and hygiene procedures. As weed and hygiene management are part of a standard suite of measures that can be effectively applied to the Proposal, BNR does not expect these indirect impacts to cause a significant environmental impact.

5.1.5.3 Habitat loss or degradation as a result of an unplanned fire event

Site activities, including site preparation, may have the potential to cause a fire that results in habitat loss and vegetation degradation. As described in Table 5-2 and Section 5.1.5.1, the general habitat and vegetation system surrounding the Development Envelope has a very large extent and distribution within the West Kimberley.

Grass fires are the most substantial ignition risk in the Development Envelope. Grass fires in the Canning Basin occur regularly during the dry season. Fire frequency varies, but typically occurs every two to four years (NAFI, 2021). Figure 5-6 and Figure 5-7 show the 2020 and 2021 fire scars resulting from natural fires, prescribed burning activities from the pastoral stations, or accidentally lit fires. Weather conditions, fire history and vegetation fuel load all contribute to grass fire patterns and intensity. Additional values and sensitivities at risk from fire events include Priority flora species and potential DRF within the wider region. If the proposed activities cause a fire, impacts to vegetation associations and species diversity in the surrounding region is unlikely to be significant given the frequency with which fires pass through the landscape. Studies into the recovery of Pindan vegetation systems following fire events conclude that Pindan vegetation structural recovery took four to five years, but that recovery could be expected over a shorter period time (Radford & Fairman, 2015).

The incidences of fire can be suitably managed through standard mitigation measures that are enacted under the *Bush Fires Act 1954* (WA) and Bush Fires Regulations 1954. As prevention of fire events can be managed through a standard suite of measures that can be easily and effectively applied to the Development Envelope, BNR does not expect these indirect impacts to cause a significant environmental impact.

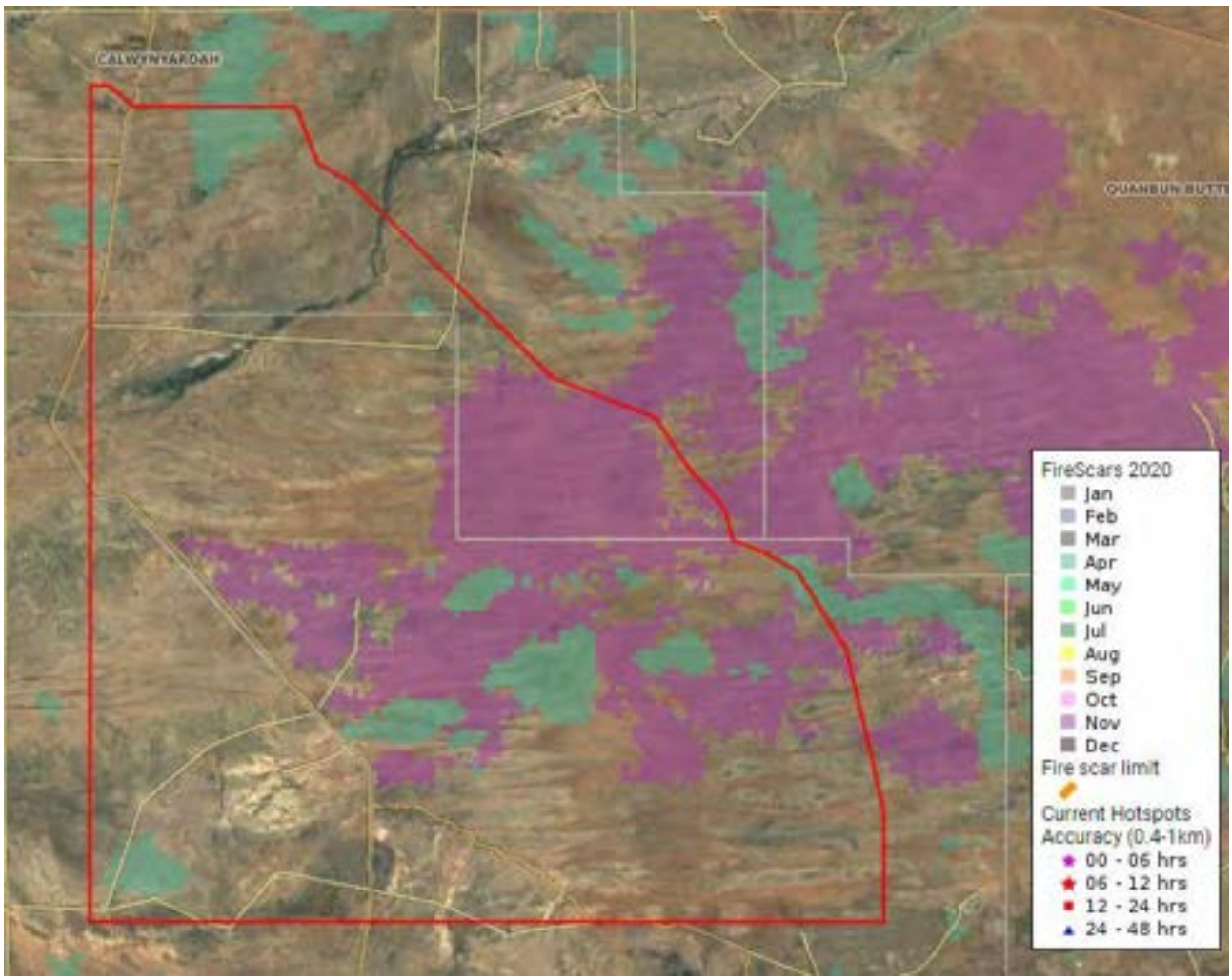

Figure 5-6: 2020 fire scars within EP 371 (NAFI, 2021)

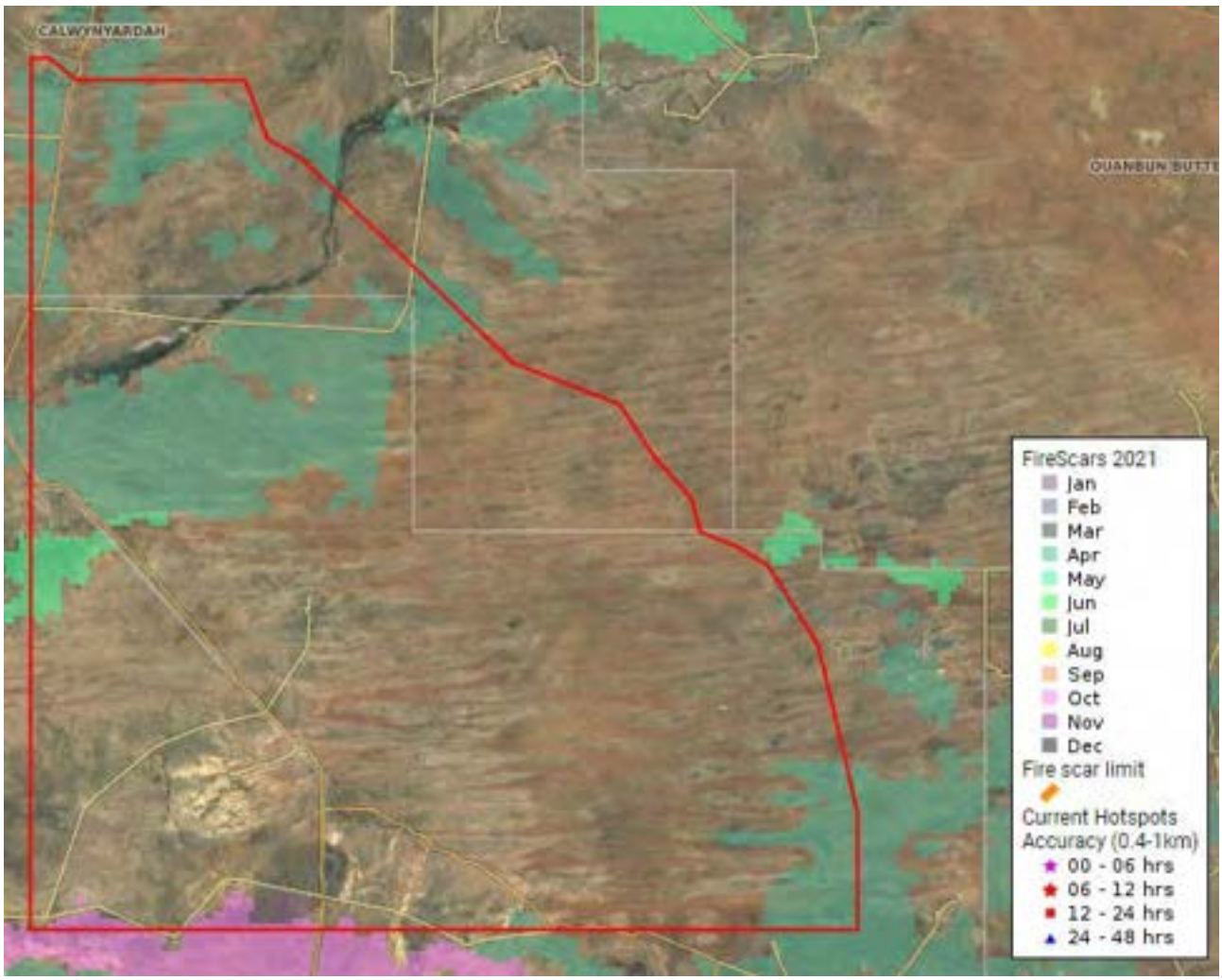

Figure 5-7: 2021 fire scars within EP 371 (NAFI, 2021)

5.1.5.4 Degradation or loss of vegetation ecology and biodiversity as a result of dust

Dust generated from vegetation clearing and driving on unsealed roads is anticipated to be produced during the proposed activities. Dust has the potential to extend outside the disturbance footprint, potentially impacting local vegetation. However, dust is not expected to extend outside the Development Envelope and impact vegetation on a regional level.

As identified in Sections 5.1.3.4, 5.1.3.5 and 5.1.3.6, no conservation significant vegetation communities and no Threatened, DRF or Priority flora species are expected to be present within the disturbance footprint; however, historically, Priority flora have been observed in the wider Development Envelope.

Dust is expected to settle on nearby native vegetation and pasture but is unlikely to create anything more than a temporary reduction in photosynthetic capacity because rainfall events tend to remove the dust from foliage. The impact is no different from other light and heavy vehicle traffic travelling over similar surfaces, such as pastoral station vehicles along pastoral tracks and vehicles travelling to the Yungngora Community along the gravel Calwynyardah–Noonkanbah Road.

A long-term monitoring program that investigated impacts of dust on vegetation for a significant development in the Pilbara over a five-year period, where high volumes of heavy and light vehicles and earthworks were present, determined that no adverse impacts occurred to plant health or vegetation communities as a result of dust loads associated with construction (Chevron Australia, 2015). Consequently, BNR does not believe that dust generation from the Proposal will result in a credible impact to vegetation.

Dust impacts to human health are evaluated in Section 5.5.5.1.

5.1.6 Mitigation

Table 5-7 summarises the mitigation measures and their hierarchy. These will be included in an EP for assessment and acceptance by DEMIRS under the PGER(E)R before activities commence.

Table 5-9: Proposed mitigation measures – flora and vegetation

Mitigation hierarchy	Mitigation measure	Further information
Avoid	Demarcation of clearing area	Demarcation of the proposed clearing area by a surveyor reduces, to the smallest possible extent, the chance of unplanned clearing outside the proposed footprint.
Avoid	Fire breaks	As required by local shire regulations, BNR is required to ensure clearances between vegetation and industrial activities are created and maintained to reduce the risk of causing a fire outside the site.
Avoid	Bush Fires Regulations 1954 and exemptions	Site preparation, construction and activities (e.g. hot work, off-road activities) (e.g. gas flaring) are prescribed activities in the Bush Fires Regulations 1954. As such, a range of management measures under the Regulations must and will be implemented.
Minimise	Topsoil windrows <2 m	With seeds and roots mainly conserved within the topsoil, topsoil will be removed and stockpiled into windrows following clearing, with subsoil left in place. It is a generally accepted industry standard that windrows should be no higher than two metres. The reason for this is that temperature in the centre of a windrow will get higher where the height/quantity of material increases. Because seed viability is reduced if temperatures increase, the quality / outcomes of revegetation using the topsoil and associated seedbank also reduces.
Minimise	Fill verified as having low weed risk	In accordance with DAWE's Arrive Clean, Leave Clean guidance (Commonwealth of Australia, 2015), it is considered good industry practice to prevent the spread of weeds by ensuring that any fill used on site (e.g. gravel, limestone marl, soil, sand) has been verified to have a low weed risk. BNR will follow this industry practice.
Minimise	Hygiene management requirements	It is considered good industry practice to prevent the spread of weeds by ensuring that civil earthmoving machinery is subject to an inspection and if required a clean-down before arriving on site and before starting ground-disturbing activities, and BNR will require its operators follow this practice.
Rehabilitate	Progressive rehabilitation	As required under the PGER(E)R, once drilling and HFS activities are complete, cleared areas that are not required to support the maintenance of infrastructure will be progressively rehabilitated to minimise environmental liability at the end of asset life. Topsoil is to be respread and rehabilitation sites actively monitored to ensure they meet the required completion criteria. Specifically, completion criteria will be developed to ensure that rehabilitation is conducted to enable long-term land use to continue. These completion criteria will be documented in the EP for acceptance by DEMIRS.

5.1.7 Environmental outcomes

The outcomes of the Proposal are predicted to be:

- no impacts to DRF, ESA, TEC, or PEC
- no impacts to Priority flora species
- no significant reduction in pre-European vegetation association extent
- no detrimental impacts to flora and vegetation values
- no impact to the overall biological diversity and ecological integrity of flora and vegetation within the Development Envelope.

Based on the predicted outcomes for the Proposal, BNR does not believe that the Proposal will result in a significant impact to flora and vegetation. The environmental mitigation measures intended to manage and minimise impacts on flora and vegetation are considered effective. Consequently, BNR believes that the EPA's objective to:

'*Protect flora and vegetation so that biological diversity and ecological integrity are maintained*'.

can be met.

BNR has considered the WA Environmental Offsets Policy (Government of Western Australian, 2011) and Guidelines (Government of Western Australia, 2014), and has used the Residual Impact Significance Model (Figure 3 in WA Environmental Offsets Guidelines) to determine if any residual impacts are significant and if these may require an offset. Using the model's process, it was determined that all residual impacts to flora and vegetation are not significant, and therefore BNR does not believe actions are required to offset the predicted outcomes of the Proposal. The assessment outcomes are presented in Section 5.11.1.

A self-assessment of impacts on matters of NES in relation to flora and vegetation was also undertaken against the Commonwealth's significant impact guidelines for matters of NES (Department of the Environment, 2013). The Proposal's activities were determined not to have a significant impact on any flora or ecological community MNES. Consultation with DAWE in June 2020 and October 2021 and the provision of BNR's self-assessment's outcomes to DAWE further confirmed that no significant impacts to any matters of NES were expected. Initial advice from the Commonwealth had been that this project was not required to be referred. BNR has continued to engage with DCCEEW to reiterate that the environmental impacts associated with the Proposal do not result in any direct or indirect mechanisms that would cause a significant impact to these matters of NES protected under the EPBC Act.

5.2 Terrestrial environmental quality

5.2.1 EPA objective

To maintain the quality of land and soils so that environmental values are protected.

5.2.2 Policy and guidance

- Environmental Factor Guideline Terrestrial Environmental Quality (EPA, 2016d)
- Environmental Protection (Controlled Waste) Regulations 2004
- Department of Water – Water Quality Protection Note (WQPN) 26 (liners for containing pollutants, using synthetic membranes) (DoW, 2013).

5.2.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing and procedure of the environmental review, as required by Section 40(3) of the EP Act. Table 5-8 lists the ESD requirements specific to terrestrial environmental quality.

Table 5-10: ESD checklist – terrestrial environmental quality

Terrestrial environmental quality		
Required work		**BNR response**
65	Present a desktop soil quality assessment within the vicinity of the well pads.	Section 5.2.3
66	Include in the ERD, figures of the mapped soil units and soil profile.	Figure 5-8 Figure 5-9 Appendix E Appendix G
67	Describe the proposed management, monitoring and mitigation methods to be implemented to address direct and indirect impact on soils/lands/receiving environment. This description is to include soil handling methods to mitigate erosion, compaction, and contamination and soil quality monitoring following site reinstatement activities.	Table 5-10 Appendix E
68	Develop a suitable soil quality monitoring program for each well, documented within the ERD that includes: • A comprehensive list of analytes proposed to be collected • A scientifically justified baseline monitoring program (including extent and duration of the program) • Trigger and threshold contingency actions.	Appendix E
69	Predict residual impacts after considering the mitigation hierarchy.	Section 5.2.5 Section 5.2.7

Terrestrial environmental quality		
Required work		**BNR response**
70	Provide a waste management strategy, including methods for segregating wastes and appropriate disposal arrangements with licensed facilities. Wastes associated with hydraulic fracture stimulation requiring evaluation and management include drilling fluid, rock cuttings, flowback fluid, and produced formation water.	Section 2.6 Table 2-8

5.2.3 Receiving environment

5.2.3.1 Soil landscape systems

The Development Envelope is within the North Fitzroy Plain Zone, which covers an area of 17,925 km^2 (Tille, 2006). The North Fitzroy Plain Zone comprises floodplains and sandplains (with alluvial and undulating plains) on Permian sedimentary rocks of the Canning Basin with self-mulching cracking clays, red deep sands, red sandy earths and red/brown non-cracking clays. Rangeland land system maps, prepared by DPIRD, describe the biophysical characteristics of each region and separates these into land systems, which are defined as repeating patterns of topography, soil and vegetation. The Development Envelope covers four soil landscape systems (Figure 5-8), which are described as (Government of Western Australia, 2021b; Payne & Schoknecht, 2011):

- 331Cm: Camelgooda System: sandplains, swales, and linear sand dunes supporting low Pindan woodlands of acacias and low woodlands of bauhinia and bloodwood with curly spinifex and ribbon grass
- 331Cy: Calwynyardah System: alluvial plains with scalded tracts downslope from lateritic remnants with yellowish loamy soils supporting patchy beefwood-bauhinia low woodlands with curly spinifex and ribbon grass; also, minor hard spinifex grasslands
- 331Dj: Djada System: active floodplains with levees and levee back slopes supporting ghost gum open woodlands with frontage grasses, and cracking clay back plains supporting ribbon grass-blue grass and Mitchell grass grasslands
- 331Ma: Mamilu System: plains and sandplains, deep red sands and yellowish loamy soils on lateritised sedimentary rocks supporting beefwood-bauhinia low woodlands and Pindan acacia shrublands with curly spinifex and ribbon grass.

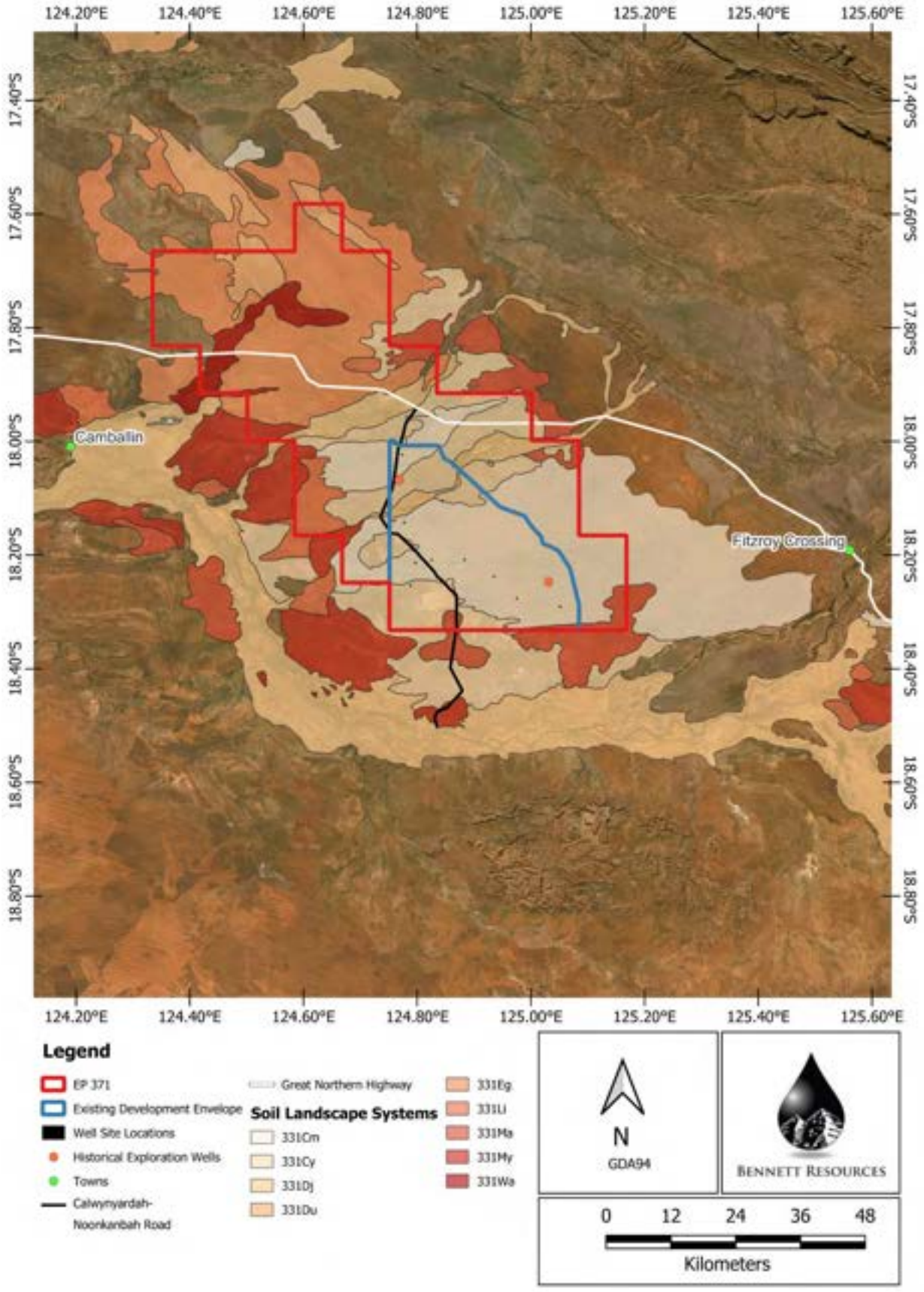

Figure 5-8: Regional extent of the soil landscape systems within the Development Envelope

5.2.3.2 Soil quality characteristics

To understand local and regional soil quality, a soil monitoring program was developed and implemented by BNR (Appendix E). The first stage of the program comprised regional baseline soil sampling undertaken within all relevant soil landscape systems near the proposed well sites in order to better understand soil quality and variability across the Development Envelope.

In August 2021, six sites were sampled within varying distances of the proposed well site locations. Soil sampling sites, shown in Figure 5-9, were selected based upon accessibility to the proposed well site locations and the relevant soil landscape system present in the area. Further information regarding the location and monitoring rationale is included as Appendix F.

At each site, a representative sample of up to 0.4 m depth within a 10 m × 10 m quadrat was taken. Sample chemistry was analysed at a National Association of Testing Authorities (NATA) accredited laboratory for a comprehensive list of analytes. Where possible, particle size distribution (PSD) by sieving and hydrometer was also undertaken. Field observations (including weather conditions, presence of pastoral activities [evidence of cattle], and fire regime) were recorded on the day of sampling. Table 5-8 lists the results of the regional baseline soil samples. The results were compared to ecological and health investigation and screening levels[7,8] as presented in the table of results; these levels are detailed in the (former) Department of Environment and Conservation's (DEC) Assessment levels for Soils, Sediment and Water document (DEC, 2010).

Further localised baseline soil sampling was undertaken in July 2023 that validated previous sampling programs the earlier sampling regime. Results from the 2023 sampling is summarised below and included as Appendix G.

5.2.3.2.1 Soil chemical analysis

Results from the baseline soil quality sampling show that, for all soil samples, all analytes were below any of the ecological and health investigation and screening levels (Appendix F). This result was expected because the land use is limited to pastoral use with no industrial activities occurring across the Development Envelope. Although some discrepancies were noted between the types of soil landscape systems within the Development Envelope, they are characteristic of the different types of soils found in this area. BNR plans to sample a standard suite of analytes, including specific analytes defined as CoPCs, which have been identified as triggers from the Proposal's activities. Table 5-9 summarises the results for several analytes and CoPCs that are relevant to the Proposal, including:

- barium
- cadmium
- chloride.

[7] "Ecological investigation levels have been developed for selected metals and organic substances and are applicable for assessing risk to terrestrial ecosystems. [These] depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2 m of soil." (NEPC, 1999).

"Ecological screening levels have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon (TPH) fractions and are applicable for assessing risk to terrestrial ecosystems. [These] broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top 2 m of soil. (NEPC, 1999).

"Health investigation levels have been developed for a broad range of metals and organic substances. [These] are applicable for assessing human health risk via all relevant pathways of exposure. [These] are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use. (NEPC, 1999).

"Health screening levels have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. [These] depend on specific soil physicochemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 m. (NEPC, 1999).

[8] Analyte screening levels may be subject to change depending on various legislation and best scientific information at the time of the sampling.

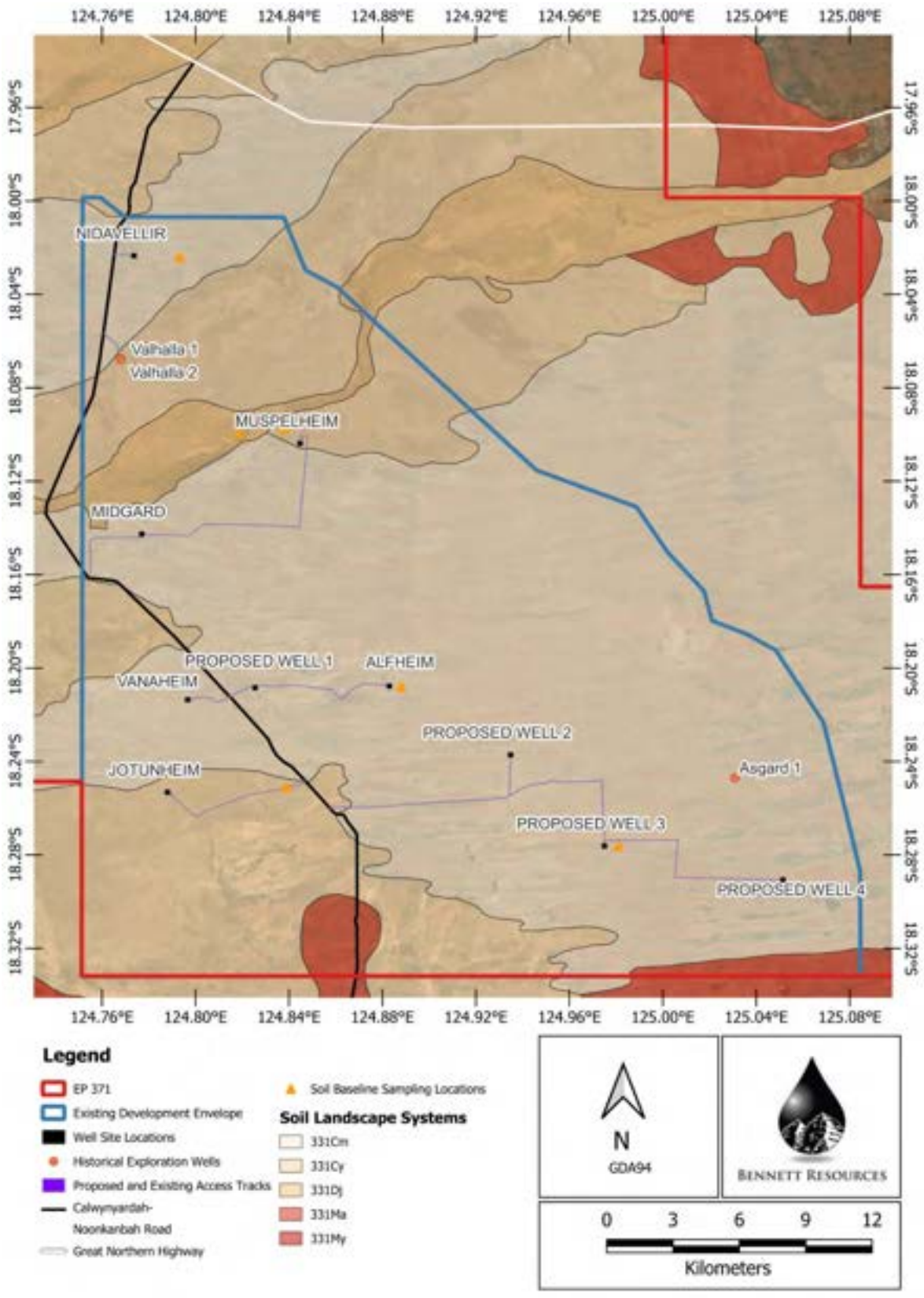

Figure 5-9: Baseline soil sampling locations

In summary, the project's baseline soil quality sampling program determined that:

- pH values ranged between circumneutral (pH 6.6–7.3) for red deep sands (331Cm) and yellow sandy earths (331Cy), and slightly alkaline (pH 7.4–7.8) for self-mulching cracking clays (331Dj)
- soils sampled within the Development Envelope recorded low electrical conductivity (EC) values that ranged from 4 µS/cm to 29 µS/cm; therefore, all samples were classed as non-saline
- deep red sands (331Cm) were found to be less saline than yellow sandy earths (331Cy), with the self-mulching cracking clays having the highest non-saline rating of 29 µS/cm
- all soils (mixtures of surface and subsoil) sampled within the Development Envelope recorded low levels of organic matter (OM) and total organic carbon (TOC), with TOC ranging between 0.38%w/w and 0.62%w/w, and OM ranging between 0.22%w/w and 0.36%w/w. In general, deep red sands recorded less OM and TOC
- metals (particularly chromium, manganese, iron) and minerals/nutrients (calcium, magnesium, potassium) were generally lower in samples from 331Cm than in 331Cy
- metals and silica in the comparative sample (located in a different soil landscape system) from the 331Dj self-mulching cracking clay (creek line soil sample) were in most cases significantly higher
- all benzene, toluene, ethylbenzene, and xylene (BTEX) and hydrocarbon results were below the laboratory's limit of reporting (LoR).

Table 5-11: Soil quality results for contaminants of potential concern

Analyte[9]	Units	Lab. Reporting Limit	Ecological Investigation and Screening Levels for Soils (mg/kg) (DEC, 2010)	Health Investigation and Screening Levels for Soils (mg/kg) (DEC, 2010)	Soil Sample					
					SM_1	SM_2	SM_3	SM_4	SM_5	SM_6
pH	pH units	0	-	-	6.7	7.8	7.1	6.8	6.6	6.7
Conductivity of extract (1:5 as received)	µS/cm	1	-	-	4	29	6	5	20	3
Total dissolved solids (TDS; by calculation)	mg/kg	5	-	-	12	87	18	15	62	10
% moisture	%w/w	0.5	-	-	<0.5	1.6	1.0	0.9	0.9	0.9
Aluminium, Al	mg/kg	50	-	-	990	5500	2200	1300	2000	1400
Barium, Ba	mg/kg	0.5	300	15,000	12	52	44	21	19	13
Boron, B	mg/kg	5	-	5,000	<5	<5	<5	<5	<5	<5
Cadmium, Cd	mg/kg	0.3	3	20	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	Cr III: 400	Cr III: 120,000	8.4	18	26	13	20	14
Iron, Fe	mg/kg	50	-	-	3900	13000	10000	4300	14000	6000
Chloride (water extractable 1:5)	mg/kg	5	-	-	38	11	51	26	51	64
Sulfate (1:5 water extractable), SO_4	mg/kg	5	2000	-	59	52	66	93	87	57
Benzene (VOC)	mg/kg	0.1	1	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene (VOC)	mg/kg	0.1	3	520	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

[9] Soil samples analysed at a NATA-accredited laboratory.

Analyte[9]	Units	Lab. Reporting Limit	Ecological Investigation and Screening Levels for Soils (mg/kg) (DEC, 2010)	Health Investigation and Screening Levels for Soils (mg/kg) (DEC, 2010)	Soil Sample					
					SM_1	SM_2	SM_3	SM_4	SM_5	SM_6
Ethylbenzene (VOC)	mg/kg	0.1	5	230	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene (VOC)	mg/kg	0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene (VOC)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total xylenes (VOC)	mg/kg	0.3	5	600	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX (VOC)	mg/kg	0.6	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
TRH C6-C9	mg/kg	20	-	-	<20	<20	<20	<20	<20	<20
TRH C6-C10	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
TRH C10-C14	mg/kg	20	-	-	<20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	-	-	<45	<45	<45	<45	<45	<45
TRH C29-C36	mg/kg	45	-	-	<45	<45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	-	-	<100	<100	<100	<100	<100	<100
TRH >C10-C16	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
Source of assessment levels			NEPM (NEPC, 1999)	Dutch B (Assink & van den Brink, 1986)	DoH (DoH, 2009)		US EPA Regional Screening Levels (US EPA, 2021)		ANZECC B (ANZECC & NHMRC, 1992)	

5.2.3.2.2 Soil physical analysis

Soil particles vary from fine clay to rocks, conventionally classed between coarse fragments (>2 mm) and fine earth (<2 mm). Sand and clay particles dominate in most WA soils and particularly within the Development Envelope. Limited PSD data (Appendix F) were available for these samples as particle sizing of soils <75 µm by hydrometer was not conducted where insufficient samples passed the 75 µm fraction. Only the comparative creek line sample SM_2, corresponding to self-mulching cracking clay soil, could be sized through hydrometry <75 µm, confirming that the other samples comprise larger particles characteristic of sandy soils.

Given that BNR plans to operate outside swamplands / damp lands where soil with high clay content is expected, the disturbance footprint is expected to consist mostly of coarse grainy sands.

5.2.3.3 Soil mapping profiles

Soil profile relates to soil structure, which comprises topsoil and different subsoil layers, from the ground surface down to where the soil meets the underlying rock. Profiles at the location and time of sampling will vary depending on the soil unit and how rocks have weathered over time. Natural variation in profiles will also depend on the type of vegetation present, the vegetation cover, and other environmental factors such as influence from surface water and groundwater.

BNR conducted a desktop review of online databases to inform sampling design. However, within the DPIRD WA soil profile database (Government of Western Australia, 2021c), no soil profiles were available for the specific soil landscape systems present within the Development Envelope.

Additional localised soil sampling was undertaken in August 2023 (GEMEC, 2023), the results of which are included as Appendix G. In summary, the soil comprises:

- 0-0.3 m: Silty clayey sand, fine-medium grain, brown, dry-damp
- 1.7-2.0 m: Silty clayey sand, fine-medium grain, brownish red, damp (from 0.7 m bgs)

- no volatile organic compound concentrations were detected in the soil via photo ionisation detector.

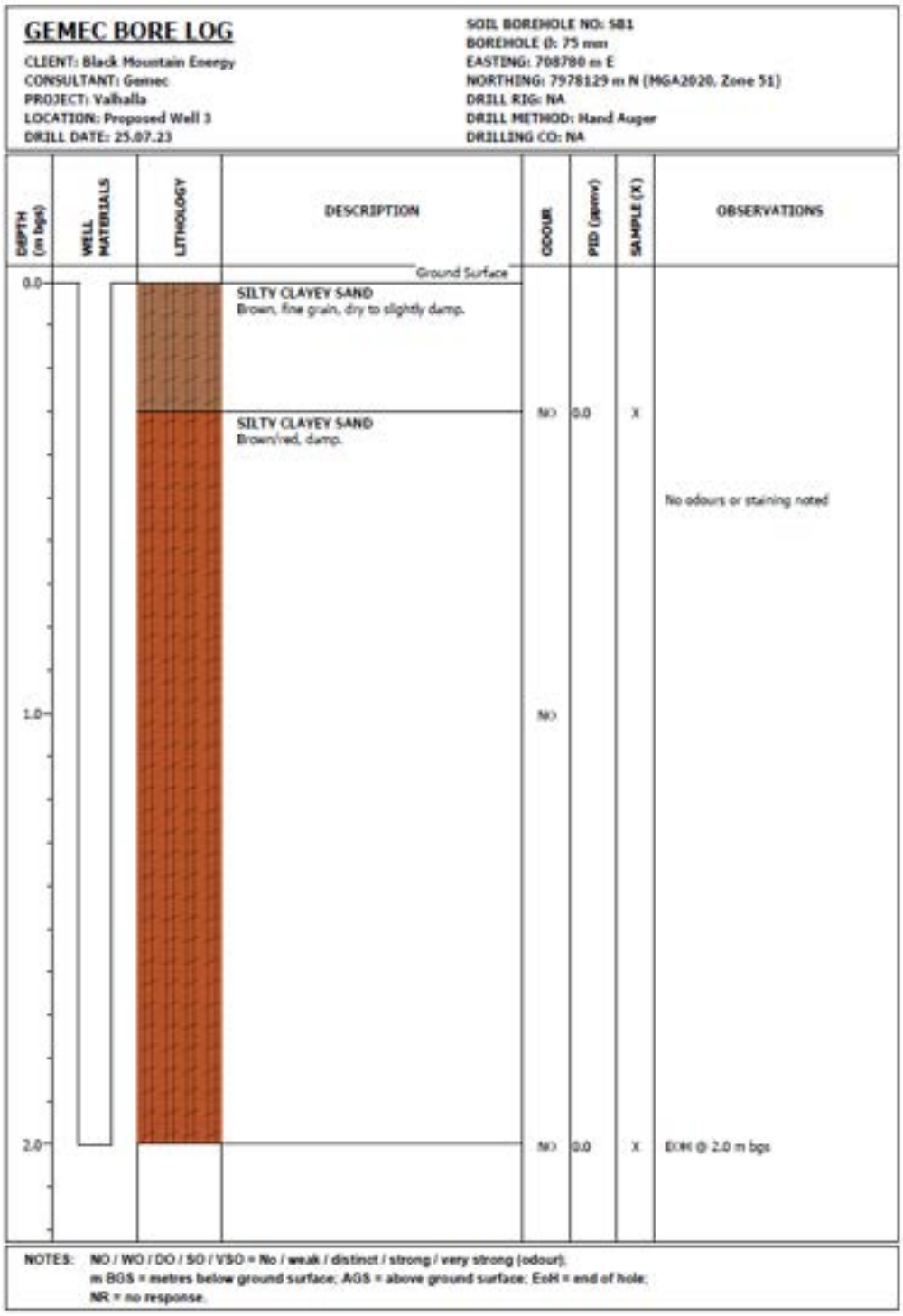

Figure 5-10: Soil profile analysed by GEMEC (Appendix G)

5.2.4 Potential impacts

5.2.4.1 Direct impacts

No direct impacts to terrestrial environmental quality are expected to arise as a result of the Proposal.

5.2.4.2 Indirect impacts

Activities from the Proposal may indirectly result in:

- erosion or scouring as a result of reduction in soil stability during civil works
- contamination of land and soils from surface spills
- inadequate rehabilitation arising from compaction.

5.2.5 Assessment of impacts

5.2.5.1 Erosion or scouring from a reduction in soil stability during civil works

Compaction can be very difficult in soils that contain significant organic matter. For this Proposal, a well site needs to have a suitable stable foundation for heavy equipment and machinery. When the site is cleared, organic material is removed (through removal of topsoil) and placed to one side. Once clearing is complete, the well site is either stabilised by importing construction fill material (e.g. gravel) or using cement to stabilise the subgrade sands. This material is then compacted to provide a suitable foundation.

As both erosion and scouring are common construction risks for all large-scale civil activities, there are well-understood mitigations that BNR will apply to reduce the likelihood that such impacts will occur. If soil materials on the site are well compacted after topsoil organics are removed and these hardstands are protected from excessive stormwater ingress, any erosion impacts arising from the Proposal would be localised and easily remediated, and therefore are not expected to be significant.

5.2.5.2 Contamination of land and soils from surface spills

Contamination of soils and the immediate surrounding land may occur from an unplanned surface spill event. To determine the spill risk and potential impacts arising from a spill, a spill risk characterisation for the Proposal is presented in Table 5-10.

Table 5-12: Proposal spill risk characterisation

Spill event	Activity				Event summary
	Site preparation operations	Drilling operations	HFS operations	Site reinstatement	
Loss of diesel during refuelling	X	X	X	X	A spill event such as this is anticipated to result in a volume of <100 L being released to the ground.
Loss of diesel from onsite diesel storage tank	X	X	X		Based on the volumes of hydrocarbon and hazardous material types anticipated for use during the Proposal, the impact evaluation is based on a full release of a 75 m^3 diesel tank.
Loss of minor volumes of hydrocarbon or chemicals during storage and handling around the well site		X	X		Various hydrocarbons and chemicals are required for the Proposal. These will generally be stored in 10 L tins, 200 L drums, and 1000 L intermediate bulk containers. Based on the loss of an entire container during transport or handling, this type of spill event is anticipated to result in a volume of <1000 L being released to ground.
Loss of drilling fluids due to circulation issues or well integrity failure		X			During drilling activities, a small amount of the drilling fluid and associated chemical additives may be lost to the environment down hole as a fugitive discharge (filtrate loss) or via in the event of failed well integrity. There is also a risk that during drilling, fluid returns may be lost to the formation where porous/cavernous geological formations are intersected and where the casing has not yet been installed and cemented in place.
Loss of HFS fluid at the surface during HFS operations			X		During HFS, some small amounts of HFS fluid may leak from the lines when the fluid is pumped to the well head. Surface line leaks may occur given the fluid's pressure contained in the lines. Based upon a worst-case scenario, this type of spill event is anticipated to result in a volume of <500 L being released to ground.

Spill event	Activity				Event summary
	Site preparation operations	Drilling operations	HFS operations	Site reinstatement	
Loss of well control		X			During drilling activities, there is the potential for an underbalanced well or equipment failure to result in a loss of well control (i.e. failure of multiple barriers). Given the target formation is "tight" rock, the likelihood of a loss of well control scenario is low with situation required to release reservoir fluids. It is reasonable to estimate that a well could be controlled within 4 weeks based upon onsite access to well control expertise and equipment. With the anticipated negligible volume of condensate produced (well under <4 m^3/day from past well testing) with the gas, and as the most likely direction of gas flow is vertical, the liquid hydrocarbon component, if present, is expected to volatise or disperse via a mist and vaporise into the atmosphere.
Loss of formation water produced during well testing			X		Produced formation water from the Laurel Formation has been characterised by the previous operator of EP 371 through the analysis of multiple water samples at a NATA-accredited laboratory. The results of the sampling program are included in Table 5-30 and Table 5-54. In summary, the produced formation water in the water retention ponds is very high in salt (3–5 times the salt concentration of sea water), not toxic to fauna or humans, and heavy metals are at very low levels. To understand the potential release volumes associated with a release of produced formation water, BNR has evaluated the produced formation water system and identified that piping or connection points were the most likely source for a release of this fluid. Based on guidance for understanding the magnitude of other similar events, and given the HFS activities are continuously supervised, a maximum credible spill volume was based on the transfer rate × 15 minutes. When including pumping rates, this equates to an instantaneous spill volume of ~50 m^3.

To understand the potential extent and subsequent impact on terrestrial environmental quality from a spill event associated with the Proposal, the worst credible spill event (associated with the complete failure of an onsite diesel storage tank) was evaluated further.

Diesel has medium viscosity. Upon release it will start spreading over and soaking into porous soils surrounding the hardstand area, which, as detailed in Section 5.2.3.1, comprise deep sands and sandy earths. Based upon Grimaz et al. (Grimaz, Allen, Stewart, & Dolcetti, 2008), it is anticipated that a large diesel release of 75 m^3 could result in an area of approximately 18,900 m^2 being contaminated if site containment and recovery is not in place. Based on the viscosity of diesel and assuming this large area is contaminated, there is the potential that hydrocarbons may seep through to a depth of around 0.50 m (calculated using equations from Grimaz et al. (Grimaz, Allen, Stewart, & Dolcetti, 2008)).

Although a spill event such as this has the potential to affect an area of approximately 18,900 m^2, the calculation also assumes that no management or mitigation barriers are in place. However, standard construction, petroleum storage, and petroleum use mitigation measures (Table 5-11) will be applied to this activity; therefore, the likelihood of such a spill event occurring is extremely low, and containment and recovery measures will ensure that any soil contamination would be minimised and remediated quickly.

Spill events from formation water produced during well testing, or spill events from chemicals during handling and transport, are expected to behave similarly to diesel upon release. However, any spill volume is expected to be much smaller. These materials will be stored within bunded areas, therefore the likelihood of an event that results in a large volume that reaches the environment is very low. Similarly, condensate from a loss of well control event is expected to volatise or disperse via a mist and vaporise into the atmosphere on release given its high volatility, suggesting soil and water contamination would be unlikely (or minimal). As a result, the extent of soil contamination associated with a 75 m^3 spill of diesel is considered to provide a conservative assessment of any spill event arising from the Proposal.

Loss of well integrity or circulation issues resulting in loss of drilling fluids to formation also have the potential to cause soil and groundwater contamination. Given these events are only credible during drilling activities (due to installation of tubing to flow hydrocarbons) the risk is limited to drilling fluids and associated chemicals. All drilling fluids selected for use are required to be assessed by DEMIRS (and publicly disclosed) under the PGER (E) Regulations. As top-hole sections are drilled with no/low toxicity drilling fluids specifically selected for use in useable aquifers, a release is considered likely to have little if any impact to other groundwater users.

Inappropriate management of waste can also result in a contamination event. However, a single waste contamination event is expected to be much smaller than a credible but unlikely worst-case hydrocarbon spill event.

Spill management measures, including bunding requirements and appropriate disposal methods, are considered part of a standard suite of measures that can be easily and effectively applied to the Proposal, BNR will also implement a surveillance soil monitoring program (Appendix E) to ensure that any localised impacts to soil quality arising from minor contamination events can be compared to baseline levels. This will support any remediation activities to ensure residual impacts are kept ALARP.

5.2.5.3 Inadequate rehabilitation arising from compaction

The risk of inadequate site reinstatement comprises a mixture of social and environmental risks. Specifically, they include a risk that the land is returned to the landowner in a state that affects their functions, interests or activities, in addition to a long-term reduction in native vegetation association extent.

Based on the vegetation associations impacted, the small quantity of vegetation affected under the Proposal is not regionally or locally significant. As described in Section 2.4.5, once the well sites are no longer required, they will be ripped to mitigate any compaction impacts. Further, rehabilitation completion criteria will be included in the EP for submission and acceptance by DEMIRS to ensure any residual impacts are appropriately addressed.

5.2.6 Mitigation

Table 5-11 summarises the mitigation measures and their hierarchy. Additionally, BNR will implement a soil quality monitoring program (Appendix E). The program includes additional baseline and surveillance data collection and details the list of analytes to be collected, as well as trigger and threshold contingency actions to be implemented during surveillance monitoring at each well site.

Table 5-13: Proposed mitigation measures – terrestrial environmental quality

Mitigation hierarchy	Mitigation measure	Further information
Avoid	HFS spread integrity assessment	All high-pressure surface lines and equipment used (including the wells) will be pressure tested during rig-up to ensure their integrity before the HFS commences.
Minimise	Produced water retention pond design	As per WQPN 26 (DoW, 2013), all lined storage compounds should have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowance for any evaporative water loss and the effects of any water re-use recovery system.
Minimise	Pond design	As per WQPN 26 (DoW, 2013), surface ponds used to contain wastewater or solids that may leach contaminants for short-term containment require synthetic membranes and need to meet specific requirements, which include: • all fluid containment liners should have a coefficient of permeability of less than 2×10^{10} m/s • a minimum thickness of 0.75 mm • dual liners • leak detection.
Minimise	Spill protection during refuelling	It is standard industry practice, which BNR will meet, for contractors to have and implement a refuelling procedure. Refuelling procedures include the requirement for refuelling in a designated area and using drip trays. BNR will ensure that, in accordance with a refuelling process, drip trays will be used for this activity.

Mitigation hierarchy	Mitigation measure	Further information
Minimise	Chemical and hazardous liquid material storage	As per Australian Standard AS 1940:2004 recommendations, BNR will ensure that: • secondary containment for hazardous materials, chemicals, and hydrocarbons comprise a volume that equals 110% of the largest container within the contained area or 25% of the combined tank volumes • tanks are double-skinned.
Minimise	Chemical disclosure	In accordance with ESD Items 5, 6, and 8, a summary of all chemicals that may be used as ingredients in drilling and hydraulic fracture is included in Appendix A. As per the requirements of Regulation 9 of PGER(E)R 2012, chemicals or substances must be disclosed for acceptance by DEMIRS before commencing activities where they are: • in, or added to, any treatment fluids to be used for drilling or hydraulic fracturing undertaken in the course of the activity • otherwise introduced into a well, reservoir, or subsurface formation in the course of the activity. In addition, all chemicals to be used downhole under the Proposal must be included on the Australian Inventory of Chemical Substances (AICS) or are otherwise approved for use in Australia. The chemicals will be used solely for the activity purpose they will serve as stated under the EP. The constituents, toxicity, ecotoxicity, and bioaccumulation data of each chemical product or system will be disclosed.
Minimise	Oil Spill Contingency Plan (OSCP)	Regulation 15 of PGER(E)R 2012 requires that an OSCP be developed for the Proposal and accepted by DEMIRS before conducting any petroleum activities.
Minimise	Spill kits	As directed by the OSCP, spill kits will be made available onsite to support the first strike / immediate response actions in the event of a spill.
Minimise	Appropriately licensed waste contractor	Waste generated during the Proposal, including potential spill-contaminated soils and materials, will be separated and stored until an appropriately licensed waste contractor disposes of the waste at a licensed facility. Specifically, any controlled waste will be managed in accordance with the Environmental Protection (Controlled Waste) Regulations 2004. Employing an appropriately licensed waste contractor reduces the risk of other accidental release events given the contractor will be experienced in transfer and transport of waste.
Minimise	Appropriate management of waste	Waste will be managed in accordance with Table 2-8 to ensure suitable disposal.
Minimise	Monitoring program	As detailed in Appendix E, BNR will implement a soil sampling and monitoring program. Specifically, additional local baseline samples, as required, will be collected from the well sites once they are established (i.e. post vegetation clearing and prior to well site sheeting) and will be used to verify the baseline sampling that has already taken place. Surveillance samples will also be undertaken prior to site reinstatement in accordance with Appendix E, and the trigger and threshold actions implemented as detailed. Appropriate site reinstatement activities and soil handling methods will also be undertaken, in accordance with the soil monitoring program, to ensure any potential soil erosion, compaction and contamination are mitigated.
Minimise	Waste management strategy	BNR will manage waste in accordance with Table 2-8.

5.2.7 Environmental outcomes

The outcomes of the Proposal are predicted to have:

- no significant or permanent impacts arising from contamination events
- no long-term impacts to the terrestrial environment or detrimental impacts from erosion, scouring, or drainage.

Based on the predicted outcomes for the Proposal, BNR does not believe that the Proposal will result in a significant impact to terrestrial environmental quality. The environmental mitigation measures intended to

manage and minimise impacts on terrestrial environmental quality are considered effective. Consequently, BNR believes that the EPA's objective to:

'*maintain the quality of land and soils so that environmental values are protected*'

can be met.

5.3 Terrestrial fauna

5.3.1 EPA objective

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

5.3.2 Legislation, policy, and guidance

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- Biodiversity Conservation Regulations 2018
- *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) (EPBC Act)*
- Environmental Factor Guideline Terrestrial Fauna (EPA, 2016e)
- Technical Guidance Sampling methods for Terrestrial Vertebrate Fauna (EPA, 2016f)
- Technical Guidance Terrestrial Fauna Surveys (EPA, 2016g).

5.3.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing, and procedure of the environmental review, required by Section 40(3) of the EP Act. Table 5-14 lists the ESD requirements specific to terrestrial fauna.

Table 5-14: ESD checklist – terrestrial fauna

Terrestrial fauna		
Required work		**BNR response**
19	In accordance with the requirements of EPA Guidance, conduct a desktop study to identify and characterise the fauna and fauna habitats to inform local and regional context; and based on the results of the desktop study: • conduct a Basic survey and fauna habitat assessment • conduct a Detailed survey • conduct targeted surveys for significant fauna that may be directly or indirectly impacted. Note: The desktop study, surveys and ERD should consider vertebrates and short-range endemic, and/or other significant, invertebrates. Survey design should ensure that adequate local and regional contextual data are collected and should consider cumulative impacts. Surveys should include sites in both impact and non-impact (reference) areas.	Section 5.3.3 Appendix C
20	Demonstrate how surveys are relevant, representative, and consistent with current EPA policy and guidance and this Environmental Scoping Document.	Appendix C
21	Provide a map of the survey effort applied in relation to the fauna habitats, the study area, Development Envelope, identifying the direct and indirect impact areas.	Figure 5-1
22	Identify and describe the fauna assemblages present and likely to be present within the Development Envelope that may be impacted by the Proposal.	Section 5.3.3
23	Identify and describe the characteristics of the fauna habitats identified by the desktop study and surveys, including a map their extents in relation to the study area, the project area, and direct and indirect impact areas. Describe significant habitats, including but not limited to: refugia, breeding areas, key foraging habitat, movement corridors, and linkages.	Section 5.3.3.1 Appendix C
24	Identify significant fauna and describe in detail their known ecology, likelihood of occurrence, habitats, and known threats. Map the locations of significant fauna records in relation to the fauna habitats, the study area, the Development Envelope, and direct and indirect impact areas.	Section 5.3.3.1 Section 5.3.3.2 Section 5.3.3.3 Figure 5-9

Terrestrial fauna		
Required work		**BNR response**
25	Identify, describe, and quantify the potential residual impacts (direct, indirect, and cumulative) to fauna assemblages, habitats, and significant species that may occur following implementation of the Proposal, after considering and applying avoidance and minimisation measures, in a local and regional context. Provide a table of the proportional extents of each habitat within the study area and Development Envelope, and the predicted amount to be directly and indirectly impacted	Section 5.3.5 Table 5-16 Figure 5-11 Figure 5-12 Section 7.2
26	Outline and justify the proposed avoidance and mitigation measures to reduce the potential impacts of the Proposal. If any significant species are expected to be impacted, include proposed management and/or monitoring plans that will be implemented pre- and post- construction to demonstrate and ensure residual impacts are not greater than predicted. Management and/or monitoring plans may be required and if so, are to be presented in accordance with the EPA's Instructions.	Section 5.1.6
27	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (p. 11) and Western Australian Environmental Offsets Template (Appendix 1) in the WA Environmental Offsets Guidelines (2014) and include reference to the Commonwealth Assessment Guide for any Matters of National Environmental Significance (MNES).	Section 5.3.7 Section 5.11.2
28	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and WA Environmental Offsets Guidelines and, where impacts relate to EPBC Act-listed taxa, the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy. Spatial data defining the area of significant residual impacts should be provided.	Section 5.3.7 Section 5.11.2
29	Demonstrate and document in the ERD how the EPA's objective for these factors can be met.	Section 5.3.7

5.3.3 Receiving environment

Fauna presence within the Development Envelope is well understood given the numerous surveys that have been conducted for previous petroleum activities within EP 371. The fauna studies relevant to the Proposal are listed in Table 5-15, with survey efforts undertaken as part of the flora and vegetation studies shown in Figure 5-1. The reports of all baseline studies confirmed that the surveys were conducted in accordance with the relevant technical EPA sampling and survey guidance. The most recent fauna survey conducted specifically for the proposed well sites, access tracks and workers' camp locations within the Development Envelope is attached in Appendix C. Following the EPA guidance, these surveys have provided a strong understanding of the local and regional context, with the most recent 2021 survey outcomes validating those of past surveys. Importantly, this survey covered the entirety of the proposed disturbance footprint.

In accordance with the Technical Guidance for Terrestrial Fauna Surveys (EPA, 2016g), further fauna and habitat reconnaissance surveys are scheduled to be undertaken before starting the proposed activities in order to ensure no adverse impact to flora or fauna. The disturbance footprint is also fixed at the proposed locations (Figure 1-2) and BNR does not seek flexibility in the proposed disturbance footprint under this Proposal.

Table 5-15: Baseline studies – terrestrial fauna

Author	Report	Distance to Development Envelope	Significant ecological communities	Significant fauna
Eco Logical Australia (2021)	Valhalla Flora and Fauna Survey	Within the Development Envelope – survey specifically undertaken for the Valhalla Gas Exploration and Appraisal Program and covered the proposed disturbance footprint	Nil	Secondary signs (i.e. diggings) of the Greater Bilby (*Macrotis lagotis*), were recorded at 4 locations in the southeast of the Development Envelope
(Low Ecological Services, 2020)	Flora and Fauna Assessment – Odin 2D and 3D seismic survey,	Within and immediately surrounding the	Nil	Unconfirmed signs of the Northern Quoll (*Dasyurus hallucatus*) and unconfirmed

Author	Report	Distance to Development Envelope	Significant ecological communities	Significant fauna
	Fitzroy Basin, Western Australia	Development Envelope		signs of the Greater Bilby (*Macrotis lagotis*) were observed
(Eco Logical Australia, 2018)	Valhalla Central 4 Flora and Fauna Survey	Within Development Envelope along creek line	Nil	Nil
(Eco Logical Australia, 2016)	Level 1 Vegetation, Flora and Fauna Survey of Kurrajong, Yakka Munga and Valhalla Central Well Sites	Valhalla Central A is the only relevant site located within Development Envelope	Nil at Valhalla Central A	Rainbow Bee-eater (*Merops ornatus*) (previously listed species)
(Murdoch University, 2016)	Targeted bilby survey of proposed well site 'Valhalla Central', and immediate area	Within Development Envelope, central	Nil	Nil
(Buru Energy and Outback Ecology, 2014)	Ophir, Paradise, Valhalla, Eden and Ellendale Flora, Vegetation and Fauna Survey Report	Adjacent to the west	Nil	Species identified up to <11 km to the west to the Development Envelope included Australian Bustard (*Ardeotis australis*) (previously listed species) and *Merops ornatus* (previously listed species)
(Low Ecological Services, 2012a)	Asgard-1 Exploration Well: Flora, Vegetation and Fauna Survey	Within Development Envelope	Nil	Nil
(Low Ecological Services, 2012b)	Asgard 2D Seismic Survey: Flora, Vegetation and Fauna Survey	Similar if not overlapping	Nil	A*rdeotis australis* (previously listed species) and *Merops ornatus* (previously listed species) – locations of the sightings not recorded in the report. Unconfirmed Greater Bilby burrow.
(Low Ecological Services, 2011a)	Flora and Vegetation Survey: Valhalla North	Adjacent to the northwest, ~2 km away from the Development Envelope	Nil	*Merops ornatus* (previously listed species)
(Low Ecological Services, 2011b)	Valhalla East-1 Exploration Well: Flora and Fauna Survey	Within Development Envelope, centre north, about 5 km south from northern extent.	Nil	*Ardeotis australis* (previously listed species)
(Woodman Environmental Consulting, 2007)	Valhalla – 01 Well Site Flora and Vegetation Survey	Within Development Envelope to northwest.	Nil	Nil

5.3.3.1 Fauna habitat

Fauna habitat has been distinguished by flora and fauna surveys conducted within the Development Envelope. The Proposal's disturbance footprint contains three broad fauna habitat types:

- fauna habitat 1: mixed open woodland over grassland on sandy clay flats and slopes
- fauna habitat 2: mixed open woodland over tussock grasses on dune slopes and crests
- fauna habitat 3: eucalypt open woodland and mixed shrubland on closed depressions and creek lines.

The fauna habitats align with the vegetation communities described in Valhalla Flora and Fauna Report . Fauna habitat 1 was the most common within the disturbance footprint, occurring across 74.80 ha (66.52 per cent) of the surveyed area. Table 5-16 lists the fauna habitats; Figure 5-11 and Figure 5-12 show their extent and location.

Table 5-16: Fauna habitat of the disturbance footprint

Fauna habitat description	Associated vegetation community [as per]	Extent (ha) within the disturbance footprint (% total)
Fauna habitat 1: Mixed open woodland over grassland on sandy clay flats and slopes	Ag, AgBc, AgCgEc, AtAcDo, BcCg, BcTc, CgAgBc	74.80 (66.52)
Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests	BcGaCg, CgCzBc, CzEcCg, EcCg	34.73 (30.88)
Fauna habitat 3: Eucalypt open woodland and mixed shrubland on closed depressions and creek lines	CbEc, EmEcAg	2.92 (2.6)
	TOTAL	**112.46 ha (100%) as recorded in the survey report**

These fauna habitats are broadly representative of the three main soil landscape systems present within the Development Envelope—the Calwynyardah, Camelgooda and Djada land systems—as described in Section 5.2.3.1. These habitats are similar to those recorded in previous surveys within the area (Buru Energy and Outback Ecology, 2014; Eco Logical Australia, 2016) and the landscape systems are represented in the broader landscape; therefore, the fauna habitats identified are not considered locally restricted .

Evidence of Greater Bilbies was recorded in the form of diggings at four locations in the southeast of the Development Envelope within Fauna habitat 2 (Section 5.3.3.2). Fauna habitat 2—mixed open woodland over tussock grasses on dune slopes and crests—is considered to provide suitable habitat for this threatened species. However, with no significant ecological communities present and no locally restricted habitats, these fauna habitats are not deemed to be significant habitats (e.g. refugia, breeding areas, key foraging habitat, movement corridors, linkages) for any species.

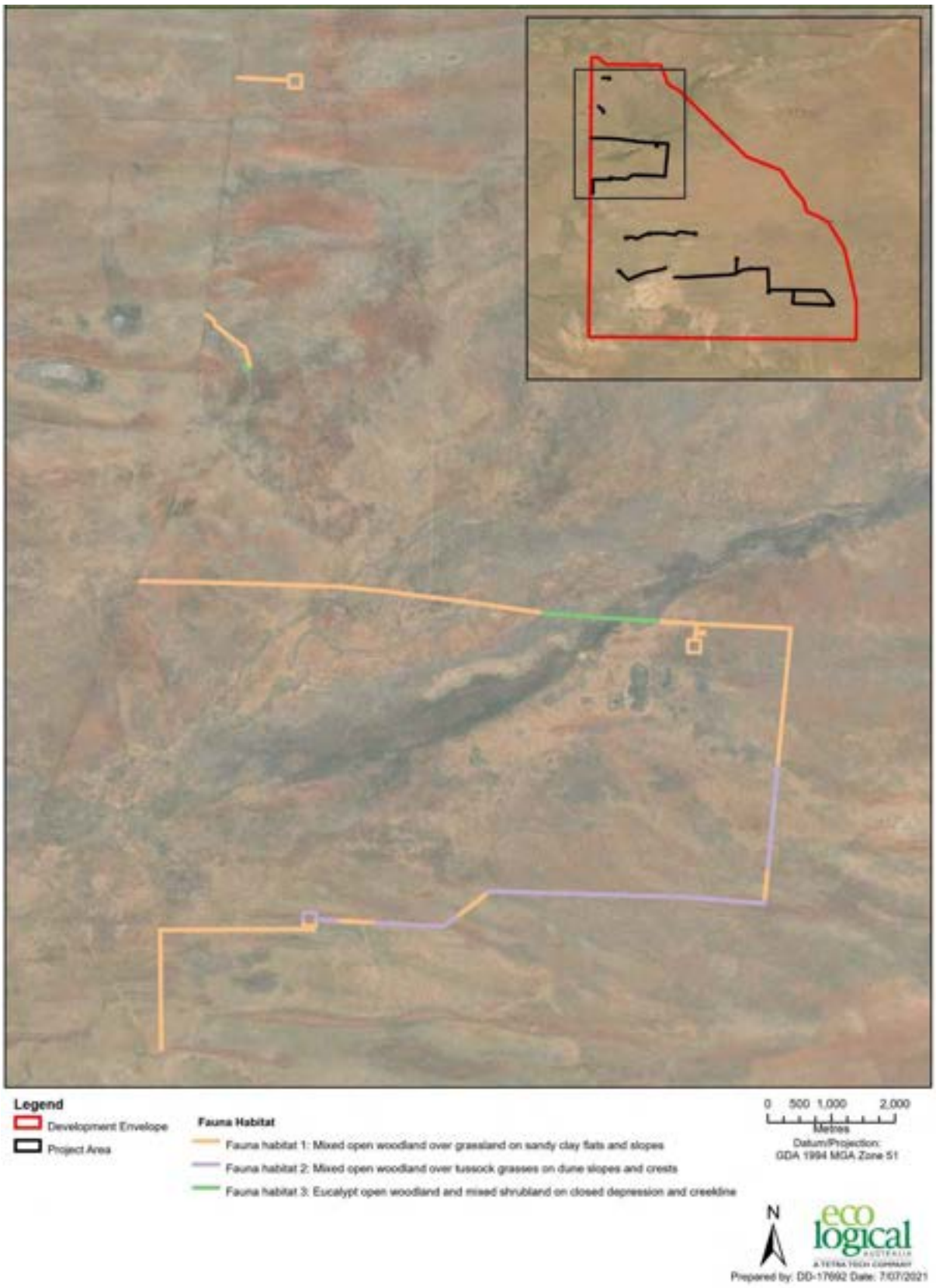

Figure 5-11: Fauna habitat within disturbance footprint (Map 1, Figure 12 from Eco Logical 2021)

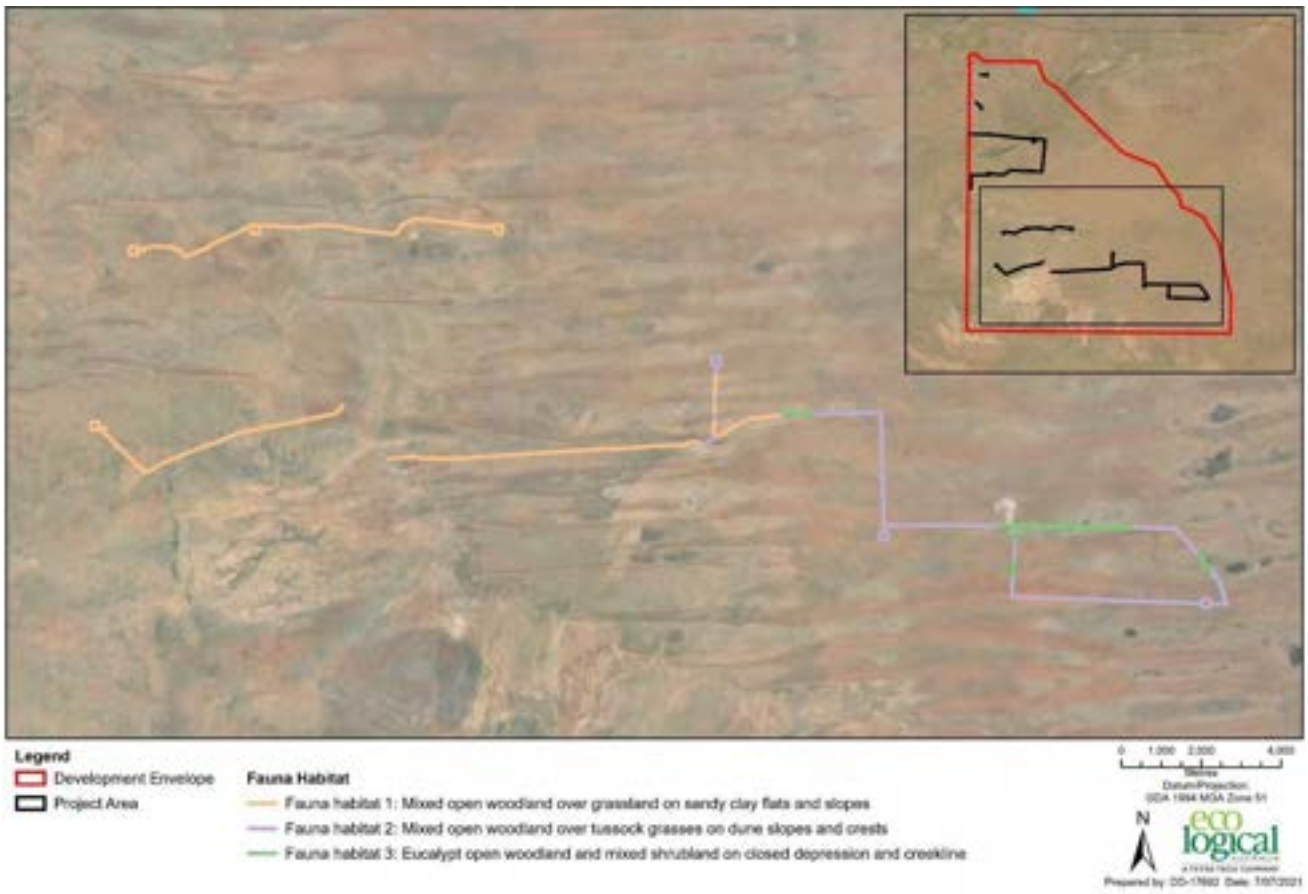

Figure 5-12: Fauna habitat within disturbance footprint, continued (Map 2, Figure 12 from Eco Logical 2021)

5.3.3.2 Protected fauna

Fauna species that have been formally recognised as threatened with extinction or as having special conservation value are protected by international, national (Commonwealth), and state (WA) legislation. At the national level, fauna species are protected under the EPBC Act. Within WA, Threatened and Priority fauna are listed under the BC Act and the Biodiversity Conservation Regulations 2018.

A desktop search of DBCA's NatureMap database identified no Threatened and Priority fauna species within a five km buffer around the Development Envelope. A search of DAWE's PMST identified that nine conservation listed species had the potential to occur within a 5 km buffer around the Development Envelope.

In total, 54 conservation listed fauna species were identified via desktop sources; however, at the completion of the fauna survey only nine of these species were considered as having the potential to occur. Their likelihood of occurrence was based on their presence in previous records in and surrounding the Development Envelope and based on the availability of suitable habitat. Based on known species ecology, known presence records and mapped habitats from the recent survey, the species with the potential to be present are summarised in Table 5-17, along with their known threats.

Note also, that some species that are no longer listed were sighted, such as the Australian bustard (*Ardeotis australis*) and the Rainbow bee-eater (*Merops ornatus*).

Although no conservation listed species were directly sighted during the on-ground basic fauna survey in 2021, secondary signs (i.e. diggings) of the Greater Bilby were recorded within the disturbance footprint at four locations in the southeast of the Development Envelope (Figure 5-14).

BNR acknowledges that due to survey limitations, a targeted level fauna survey was unable to be adequately met within all sections of the Disturbance Footprint. However, given the presence of the species in the

region, it is likely that habitat is available for the Greater Bilby (Macrotis lagotis) throughout the entire Development Envelope. Specifically, it was identified that fauna habitat 2 provides preferred habitat for this species. BNR has assessed the impact to this species conservatively on the basis that all of Fauna Habitat 2 is habitat to this species. However, BNR does not believe that additional surveys are required given the mitigations presented in Section 5.3.6, which ensure that no impacts to active burrows can arise from this activity. However, BNR plans to complete a targeted survey at an appropriate time being (at least) six-months prior to commencing the activity to ensure no active burrows are present within the Disturbance Footprint. BNR believes that given the ability to eliminate direct impacts (to habitat considered critical to the species survival (i.e. active burrows) BNR believes a completed targeted survey is not required at this stage of the assessment.

Table 5-17: Conservation listed fauna species with the potential to occur within the disturbance footprint and Development Envelope (post-survey)

Common and scientific names	Conservation status		Preferred habitat based upon habitat mapping within the disturbance footprint	Known threats from the DAWE Species Profile and Threats Database (DAWE, 2021b) and associated species recovery plans
	Commonwealth (EPBC Act)	WA (BC Act)		
Greater Bilby (*Macrotis lagotis*)	Vulnerable	Vulnerable	**Fauna habitat 2**: Mixed open woodland over tussock grasses on dune slopes and crests is considered to provide suitable habitat for this species.	Habitat destruction Predation by feral cats and foxes
Northern Short-tailed Mouse (*Leggadina lakedownensis*)		Priority 4	Suitability of available habitat (spinifex and tussock grasslands, Acacia woodlands)	N/A
Spotted Ctenotus (northeast) (*Ctenotus uber johnstonii*)		Priority 2	Presence of potentially suitable habitat: **Fauna habitat 1** – hard reddish soils.	N/A
Gouldian Finch (*Erythrura gouldiae*)	Endangered	Priority 4	**Fauna habitat 1**: Mixed open woodland over grassland on sandy clay flats and slopes **Fauna habitat 2**: Mixed open woodland over tussock grasses on dune slopes and crests are considered to provide potentially suitable habitat for this species.	Inappropriate fire regimes Grazing impacts
Grey Falcon (*Falco hypoleucos*)	Vulnerable	Vulnerable	These species have wide ranges; thus their habitat requirements are broad and varied, some of which are met by all fauna habitats within the disturbance footprint in the form of plains, grasslands, and shrublands.	N/A
Peregrine Falcon (*Falco peregrinus*)		Other specially protected fauna		N/A
Common Sandpiper (*Actitis hypoleucos*)	Marine, Migratory	Migratory	Migratory bird species (of vagrant and mobile nature) may use habitat within the disturbance footprint only when conditions are favourable (e.g. after periods of heavy rainfall).	N/A
Fork-tailed Swift (*Apus pacificus*)	Marine, Migratory	Migratory		N/A
Sharp-tailed Sandpiper (*Calidris acuminata*)	Marine, Migratory	Migratory		Habitat loss Habitat degradation Direct mortality
Glossy Ibis (*Plegadis falcinellus*)	Migratory	Migratory		Wetland destruction or degradation Clearing, grazing burning, increased salinity, groundwater extraction, and invasion by exotic plants and fish species

Common and scientific names	Conservation status		Preferred habitat based upon habitat mapping within the disturbance footprint	Known threats from the DAWE Species Profile and Threats Database (DAWE, 2021b) and associated species recovery plans
	Commonwealth (EPBC Act)	WA (BC Act)		
				Hunting and pesticides

5.3.3.3 Short-range endemics

Short-range endemic (SRE) species are terrestrial or freshwater invertebrate species that have naturally small geographical distributions of <10,000 km^2 (Harvey, 2002). Assessments of SRE occurrences are often based on eight or fewer groups of invertebrates, such as land snails, earthworms, scorpions, pseudoscorpions, mygalomorph spiders, millipedes, centipedes, and isopods (crustaceans). Little information is available about SRE species in the Kimberley other than that they occur in the West Kimberley in restricted habitats or geographic features of smaller size that may be more likely to support unique species. These types of habitats with the potential to support SREs can occur in all WA bioregions, and may include vine thickets, boulder piles, isolated hills and rock outcrops, vegetated gullies, drainage features, and seasonally inundated swamps (Harvey, 2002). In the Kimberley, rocky ridges and outcrops (such as limestone), and seasonally inundated swamps are the habitat types with the potential to support SREs.

A desktop assessment of SRE fauna (Bennelongia, 2011) was undertaken across the Noonkanbah and Blina pastoral stations, with the defined search area of WA Museum (WAM) records covering most of the Development Envelope (Figure 5-12). The physical study area defined for the SRE survey was 33 km southeast of Camballin and as close as ~10 km west of the Development Envelope.

A further assessment was undertaken by Bennelongia for this Proposal (Bennelongia 2023, Appendix S) of the likelihood of habitats supporting SREs within this region. Bennelongia found no TECs or PECs in the vicinity of the project area.

The WAM search for arachnids and related species within the 10,000 km^2 search area encompassing most of the Development Envelope yielded two records of mygalomorph spiders in Camballin. However, these species are known to be widespread in WA and are not considered SREs. Because these arachnids tend to favour and inhabit vine thickets and microhabitats with soil accumulation and moisture-holding capacity (Main, 1991), it is unlikely for mygalomorph spiders to be encountered during the Proposal given the absence of such environments.

In accordance with the environmental impact assessment context in WA, the term SRE is used in this Proposal document to refer only to surface-dwelling invertebrates (EPA, 2016h). The likelihood of SRE fauna occurring within the Development Envelope can be inferred from the occurrence of geographic boundaries, landform changes, or those specialised and isolated habitats suitable for SREs. The habitats described above and considered within the Bennelongia desktop assessment (2011) and a follow-up assessment commissioned specifically for this project (2023 – Appendix S) (vine thickets, rocky limestone outcrops etc.) do not occur within the Proposal's disturbance footprint and are not expected to occur within the Development Envelope. Additionally, any perennial marshland areas (low probability of supporting SREs in this region) were avoided when defining the Proposal's disturbance footprint.

Consequently, BNR does not believe that the Proposal's activities, specifically ground disturbance, will result in a significant impact to surface-dwelling SRE invertebrate species; therefore, potential impacts to SREs from the Proposal are not considered further.

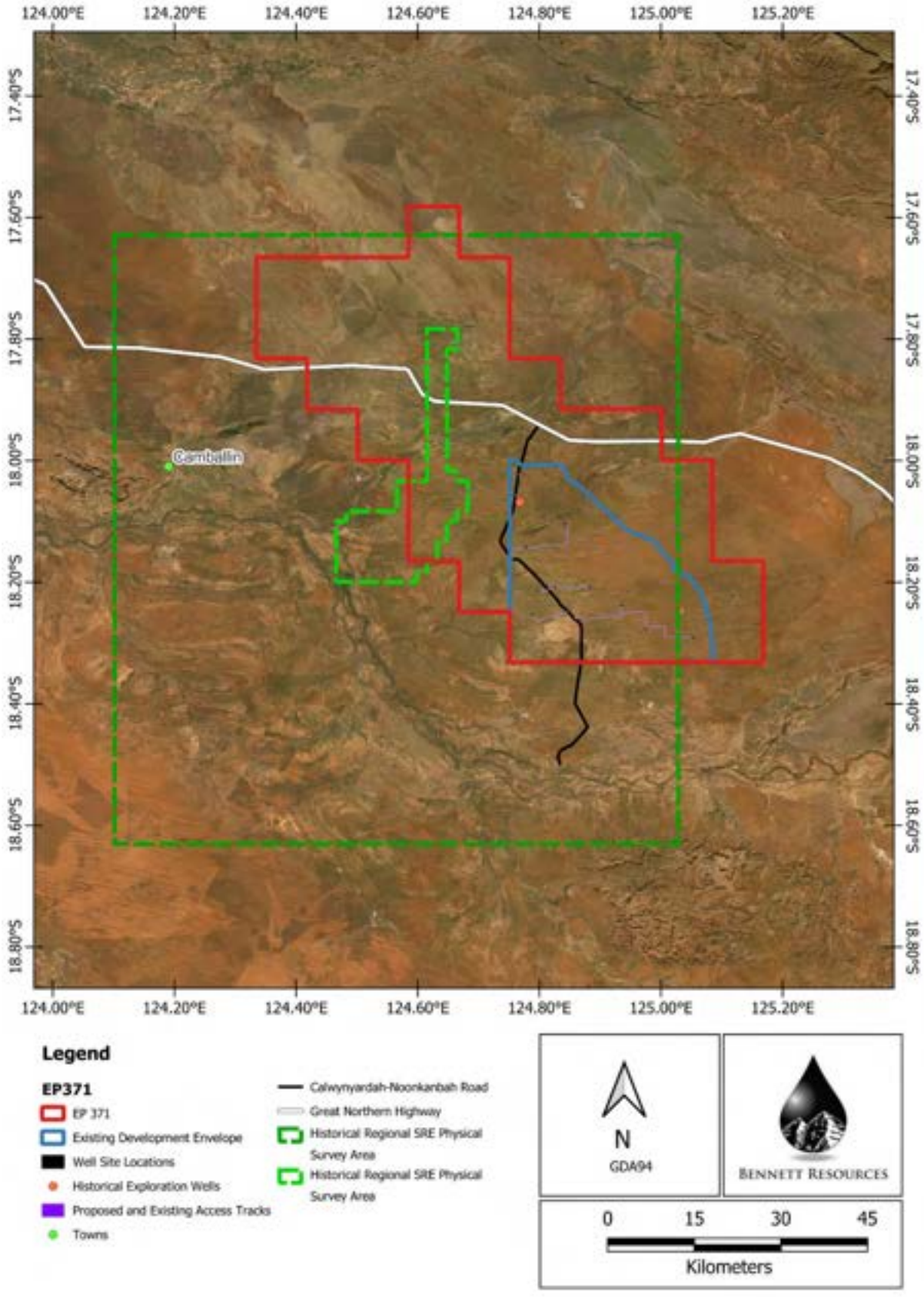

Figure 5-13: Location of regional SRE desktop assessment (adapted from Figure 1 in (Bennelongia, 2011))

5.3.3.4 Introduced species

The *Biosecurity and Agriculture Management Act 2007* (WA) allows animal species that have a negative impact on agricultural production and the environment to be Declared as pests. Declared species are listed with a corresponding category that determines the level of management required to control each species.

The DAWE PMST report lists seven pest species that are likely to occur within a five km radius of the well locations:

- *Canis lupus familiaris* (domestic dog)
- *Equus asinus* (donkey, ass)
- *Equus caballus* (horse)
- *Felis catus* (domestic cat)
- *Rhinella marina* (cane toad)
- *Sus scrofa* (pig)
- *Vulpes vulpes* (Red fox, fox).

All these species have been Declared under state legislation.

The Development Envelope is located within pastoral stations and these lands are used for cattle grazing; therefore, *Bos taurus* (Cattle) are also present within and surrounding the Development Envelope.

5.3.4 Potential impacts

5.3.4.1 Direct impacts

Direct impacts from the Proposal's activities may include:

- death or displacement of native fauna species
- habitat destruction
- habitat fragmentation.

5.3.4.2 Indirect impacts

In addition to potential direct impacts to fauna and fauna habitat arising from the Proposal, these indirect impacts to terrestrial fauna may arise:

- habitat degradation as a result of the introduction and/or spread of non-indigenous species (weeds)
- habitat degradation as a result of an unplanned fire event.

5.3.5 Assessment of impacts

5.3.5.1 Death or displacement of native fauna species

Throughout all phases of the Proposal there are the two common sources of fauna interaction: entrapment and fauna strike. These interactions have the potential to cause death or injury to fauna. The fauna assemblage of the Development Envelope is considered intact, relatively diverse, and representative of the West Kimberley region. Conservation significant fauna with the potential to be present are mobile with wide-ranging distributions. Although mobile fauna may be encountered, the limited extent of disturbance and duration of the Proposal means that interactions with fauna (if any) are expected to be low in number.

The temporary increase in impacts such as noise and vibration resulting from the Proposal were also considered. Such impacts may have the potential to displace fauna species. As the Development Envelope is situated within two pastoral stations, where pastoral, petroleum activities, and vehicle movements associated with the local community are common, fauna are likely to be accustomed to noise and traffic movement. Additionally, noise impacts are restricted to short periods of loud activities, including mobilisation and demobilisation of people and equipment. Therefore, it is expected that fauna would avoid the area during these times. The death or displacement of native fauna species as a result of the Proposal remains possible;

however, the Development Envelope has similar habitat throughout, and any displacement would be limited to the activity, causing only short-term and temporary impacts. Noise impacts to social surroundings are further evaluated in Section 5.5.5.2.

Because the pathways for fauna interactions are well understood, the mitigation measures for preventing or reducing these interactions are well established. These risks are well managed through existing good practice mitigation measures, which are well understood and implemented by the industry. The potential interaction and the significance of the Proposal's interaction with fauna of conservation significance recorded during the 2021 fauna survey is provided in the paragraph below. Given the combined results of the on-ground 2021 fauna and habitat survey and the desktop assessment detailed in Section 5.3.3.2, the impact assessment specifically focused on impacts to bilbies.

The lack of information regarding bilby habitat preference in northwestern Australia has resulted in some ambiguity in management (Dawson, 2017). In the West Kimberley region, Greater Bilbies (*Macrotis lagotis*) have been associated with red sands and dune fields, Pindan woodlands, and hummock and tussock grasslands (Cramer, et al., 2016). This species has 3,303 documented occurrences (Figure 5-14) across a widespread area throughout WA, with a large population presence around the Broome area. While no bilbies (or recent burrows) were recorded or identified during the most recent surveys within the project area, secondary signs (i.e. diggings) were identified, as seen in Figure 5-15, indicating that the species is present . According to Eco Logical Australia , the vegetation around the southeast of the project area could be considered as appropriate bilby habitat (Fauna habitat 2 in Table 5-16, Section 5.3.3.1); however, suitable habitat is also widely available throughout the broader region. Although this species is likely present in/near the Development Envelope, any impacts would be as a result of unplanned interactions that would likely impact the species at an individual level rather than a population level. Consequently, as no direct impacts are planned, and as unplanned impacts would likely only be limited to individuals, this species is not expected to be significantly impacted due to the magnitude and duration of the Proposal and the species' widespread distribution throughout WA.

BNR understands that given the time lapse between completing the survey and getting the Proposal approved, an additional pre-construction survey is important to ensure that the Proposal will not impact on any bilbies or other priority flora or fauna.

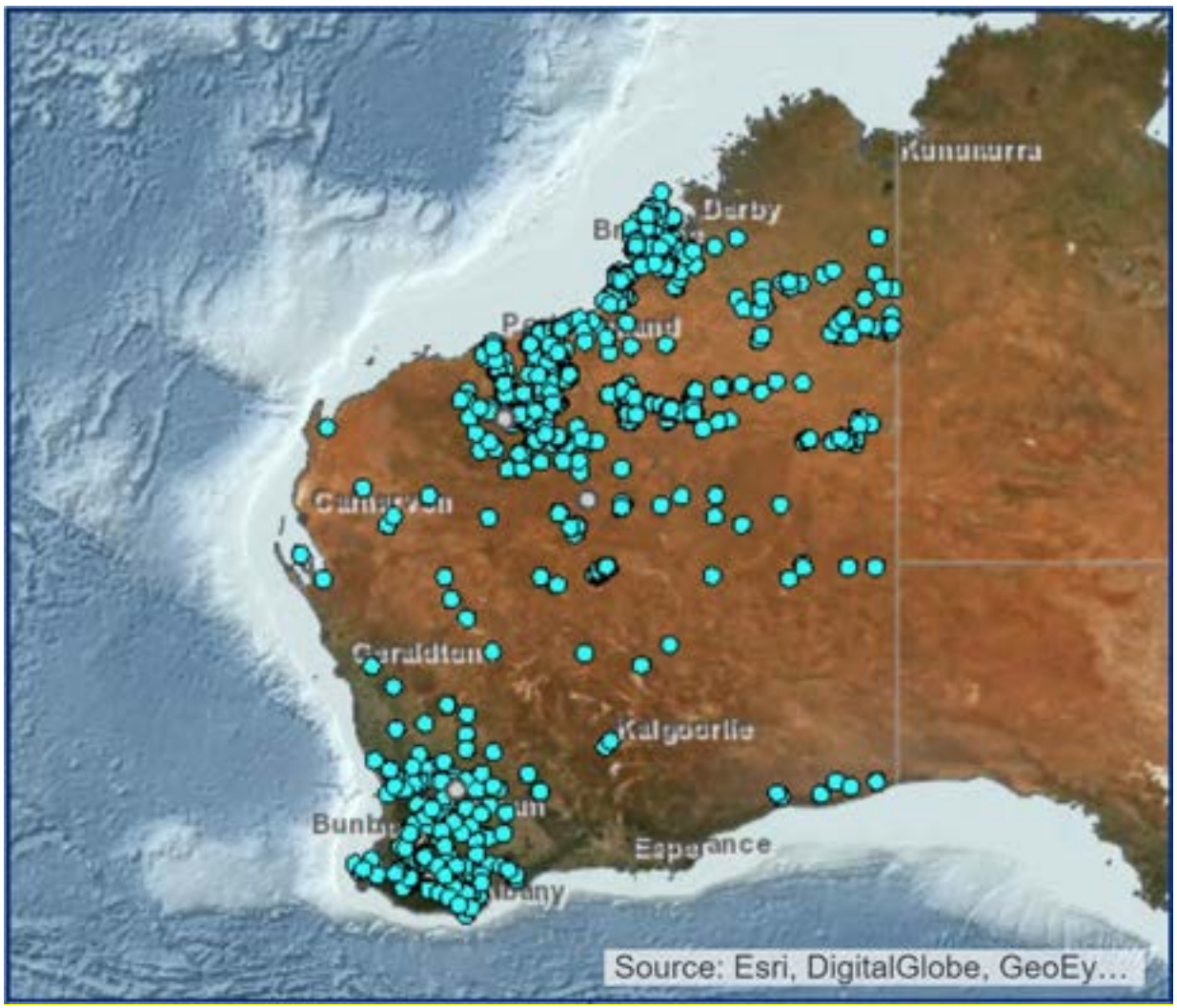

Figure 5-14: NatureMap records for *Macrotis lagotis* (Greater Bilby) (DBCA, 2021)

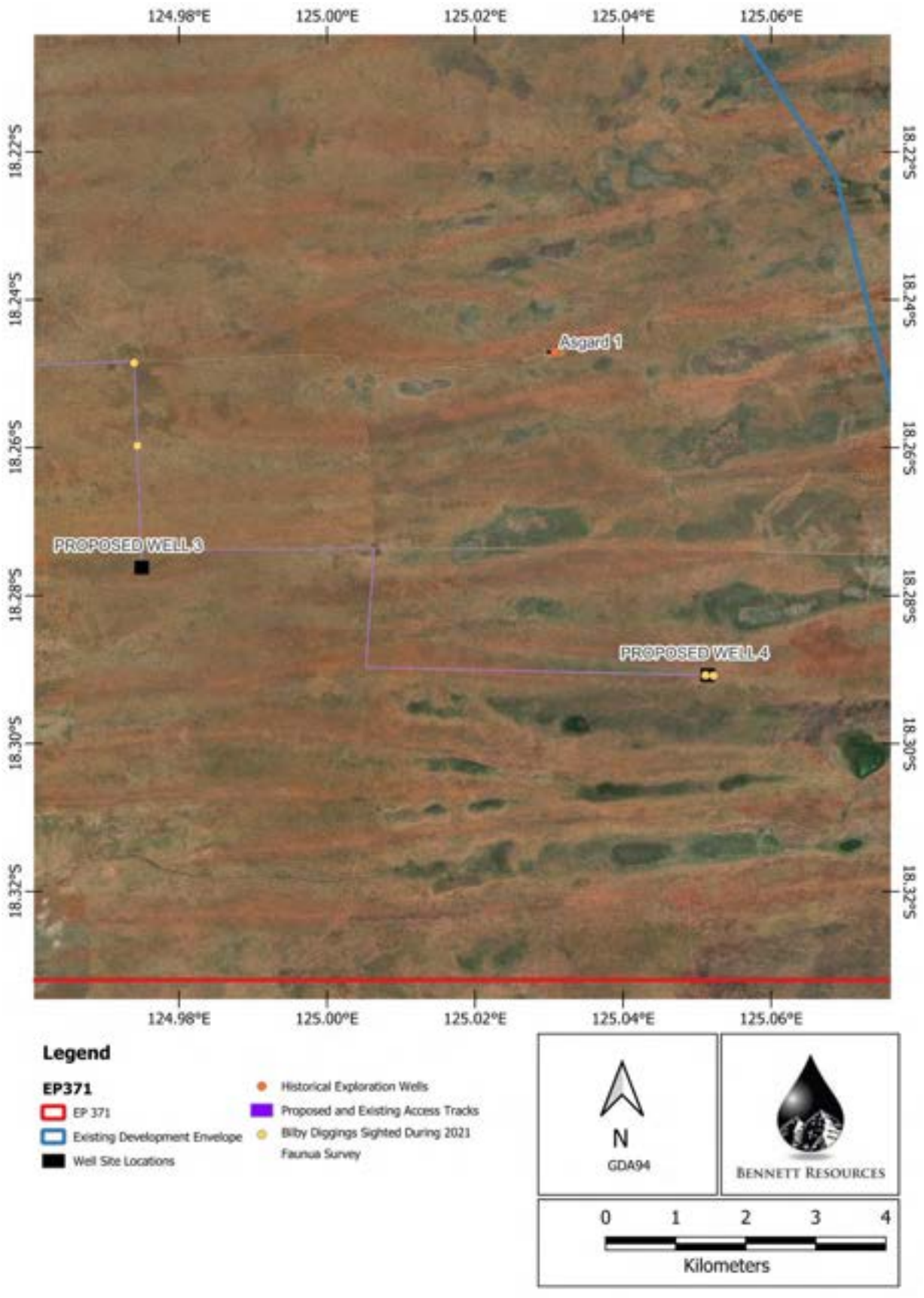

Figure 5-15: Location of recent Greater Bilby diggings (no direct species sighted on the permit)

5.3.5.2 Habitat destruction

Habitat destruction is listed as a specific threat (Table 5-17) under the National Recovery Plan for the Greater Bilby (*Macrotis lagotis*) (Pavey C. , 2006). The species is known to have a wide distribution, occupying a broad range of vegetation and localised impacts from the Proposal are limited to clearing approximately 110 ha of vegetation. As described in Section 5.1.3.4, vegetation associations identified within the project area are well represented within pre-European extents, indicating that the extent of impact associated with the Proposal is unlikely to be significant given that similar vegetation and thus habitat is present throughout the wider region.

Although ~30 per cent of the disturbance footprint comprises suitable bilby habitat (Table 5-16), the vegetation communities associated with this habitat type are contiguous and well represented in the wider area. Bilby habitat was associated with the broadscale vegetation association North Fitzroy Plains_700, therefore the extent of direct impact to bilby habitat within the project area is estimated to be <0.017 per cent. Because similar habitat is present outside the project area, the actual impact to bilby habitat is expected to be much smaller. In addition, no habitat critical for the survival of the species has been identified within the project area. The vegetation and fauna habitat to be impacted is ubiquitous; therefore, it is unlikely that large numbers of the species would be encountered, displaced, or impacted by the Proposal.

5.3.5.3 Habitat fragmentation in the immediate area of clearing

Fragmentation, or the breaking up of large areas of intact vegetation, may have negative impacts on overall ecosystem functioning and fauna and flora community structure (pollination, seed dispersal etc.). Examples of impacts from fragmentation include the disturbance to, or interruption of, fauna movements, foraging, and hunting behaviours. Approximately half of Australia's species currently listed as Threatened under the EPBC Act are considered to be at risk from habitat fragmentation (Jackson, et al., 2016). However, habitat fragmentation is not listed as a specific threat under the National Recovery Plan for the Greater Bilby (Pavey C. , 2006).

Mature bilbies have a large home range with individuals recorded on consecutive days as occupying burrows >2 km apart (Southgate & Possingham, 1995). Estimates of short-term home range sizes vary from 1.1 km^2 to 3 km^2 (Southgate & Paltridge, 1998). Consequently, localised fragmentation from the Proposal would not be expected to impact the movement of individuals. Although there is the potential for indirect impacts arising from opening up habitat to predators, there is no evidence to indicate any overall increase in predation because there is limited temporal overlap between the Greater Bilby and its predators (Dawson, 2017).

Consequently, the Proposal is unlikely to hinder these species moving through the landscape nor cause significant impacts due to habitat fragmentation.

5.3.5.4 Habitat degradation as a result of the introduction and/or spread of non-indigenous species (weeds)

Although the presence and introduction of weeds is not listed as a specific threat under the National Recovery Plan for the Greater Bilby (Pavey C. , 2006), monitoring of weed invasion impacts is noted as a research action. An increased presence of weeds may inhibit ground movements and hunting by fauna species including bilbies, or foster fire regimes that are more intense and that are more likely to cause direct mortality, reduce availability of shelter and reduce habitat heterogeneity.

Because the pathways for spreading or introducing weed species are well understood, the mitigation measures for preventing or reducing these interactions are well established. These risks are well managed through existing good practice mitigation measures, which are understood and well implemented by the industry. With standard industry management measures in place, no significant impacts are expected.

5.3.5.5 Habitat loss or degradation as a result of an unplanned fire event

Inappropriate fire regimes are listed as a specific threat under the National Recovery Plan for the Greater Bilby (Pavey C. , 2006). Fire events have the potential to cause various impacts, including direct mortality and injury, or indirect mortality by altering habitat, reducing food abundance, restricting breeding and increasing predation due to a reduction in ground cover. Fires may also impede dispersal and colonisation of unoccupied areas by the species (Pavey C. , 2006).

Grass fires occur regularly in the Canning Basin during the dry season. Although fire frequency varies, grass fires typically occur every two to four years (NAFI, 2021). Weather conditions, fire history and vegetation fuel

load all contribute to grass fire patterns and intensity. Fire scar data shows that the areas in and around the project area has been subject to burning events (natural fires, or prescribed burns from pastoral activities), as seen in Figure 5-7.

Because the sources of fire events are well understood, the mitigation measures for preventing or reducing these events are well established. These risks are well managed through existing good practice mitigation measures, which are well understood and implemented by the industry. With standard industry management measures in place, no significant impacts are expected.

5.3.6 Mitigation

Table 5-18 summarises the mitigation measures and their hierarchy. These will be included in an EP for assessment and acceptance by DEMIRS under the PGER(E)R before activities commence.

Table 5-18: Proposed mitigation measures – terrestrial fauna

Mitigation hierarchy	Mitigation measure	Further information
Avoid	Fauna exclusion and egress	In accordance with the Fauna Egress Matting and Ramps guidance (DMP, 2012), BNR will implement fauna exclusion and egress management measures where lined ponds / fauna traps are present to reduce likelihood of entrapment and allow egress if the initial exclusionary barriers fail. Water retention ponds will be fenced with 1 m high feral ring lock mesh fencing with small-animal mesh attached to the base of the fence to help prevent ingress of small animals. During drilling activities, one section of the mud sumps will be unfenced in front of the shakers to allow the cuttings chute to be directed into the sumps.
Avoid	Targeted Bilby Survey	At least 6 months prior to clearing activities commencing, a targeted survey will be undertaken to identify any active and non-active bilby burrows throughout the Disturbance Footprint. Where evidence of species presence exists, specific bilby management measures (detailed below) will be implemented.
Minimise	Specific bilby management measures	To mitigate potential impacts to bilbies during site preparation, these steps will be implemented if a bilby burrow is identified within the disturbance footprint: • the disturbance footprint will be scouted for new burrows (within a range of ~75 m) • no clearing will be undertaken within 50 m of any identified burrows • no clearing will be undertaken within 75 m of identified active burrows • vehicle speed limits will be reduced from dusk to dawn to: ◦ 20 km/h in areas where bilbies have been recorded ◦ 40km in areas where bilbies have not been recorded.
Minimise	Speed limits	Vehicle speed limit signage will be installed along access tracks and at well sites. By reducing speed limits where limits are not set by law, the number of fauna strike incidents are expected to be reduced.
Avoid	Fire breaks	In accordance with local shire regulations, firebreaks will be installed and maintained to ensure clearances between vegetation and the petroleum activities reduce the risk of causing a fire.
Avoid	Bush Fires Regulations 1954	Under the Bush Fires Regulations 1954, site preparation, construction and activities (hot work and off-road activities) (i.e. gas flaring) are considered prescribed activities. As such, a range of management measures under the Regulations will be implemented, including the clearing of flammable material from around buildings, creating firebreaks and ensuring firefighting equipment is kept and well maintained at each well site.
Minimise	Site inspections of fauna traps	BNR will conduct routine inspections of areas considered to be potential fauna traps. These include open excavations or well cellars, if they need to be left open. Egress paths from ponds will also be regularly inspected to ensure their useability.
Minimise	Weed management measures	BNR will comply with the Arrive Clean, Leave Clean guidance (Commonwealth of Australia, 2015), to prevent spread of weeds by ensuring that fill for civil works (e.g. gravel, limestone marl, soil, or sand) has been verified to have a low weed risk. Good hygiene measures will also be implemented, as prior to entering the well sites, earthmoving machinery and equipment being checked for weeds or weed-contaminated materials and cleaned if necessary.

Mitigation hierarchy	Mitigation measure	Further information
Minimise	Introduced predator management	BNR will provide all records of introduced predatory species opportunistically observed over the course of the activity to DBCA. Where consistently high numbers are observed, and in consultation with DBCA, BNR will identify and implement measures that are considered suitable and commensurate to the nature of the activity.
Rehabilitate	Progressive rehabilitation	In accordance with the PGER(E)R requirements, once drilling and HFS activities are complete, cleared areas that are not required to support the maintenance of infrastructure will be progressively rehabilitated to minimise environmental liability at the end of asset life. Topsoil and vegetation will be respread, and rehabilitation sites actively monitored to ensure they meet required completion criteria. Completion criteria will be documented in the EP and approved by DEMIRS.

5.3.7 Environmental outcomes

The outcomes of the Proposal are predicted to be:

- no impact to listed fauna species' populations
- no significant degradation, loss, or fragmentation of habitat surrounding the Development Envelope.

Based on the predicted outcomes for the Proposal as shown above, BNR does not believe that the Proposal will result in a significant impact to terrestrial fauna. The environmental mitigation measures intended to manage and minimise impacts on terrestrial fauna are considered effective. Consequently, BNR believes that the EPA's objective to:

'*protect terrestrial fauna so that biological diversity and ecological integrity are maintained*.'

can be met.

BNR has considered the WA Environmental Offsets Policy (Government of Western Australian, 2011) and Guidelines (Government of Western Australia, 2014), and has used the Residual Impact Significance Model (Figure 3 in WA Environmental Offsets Guidelines) to determine if any residual impacts are significant and if these may require an offset. Using the model's process, it was determined that all residual impacts to terrestrial fauna are not significant, and therefore BNR does not believe actions are required to offset the predicted outcomes of the Proposal. The assessment outcomes are presented in Section 5.11.2.

A self-assessment of impacts on matters of NES in relation to terrestrial fauna was also undertaken against the Commonwealth's significant impact guidelines for MNES (Department of the Environment, 2013). Although the presence of the matter of NES—the Greater Bilby—within the Development Envelope was identified from diggings, the Proposal's activities were determined not to have a significant impact on this matter of NES. Consultation with DAWE in June 2020 and October 2021 and the provision of BNR's self-assessment's outcomes to DAWE confirmed that no significant impacts to any matters of NES were expected. Initial advice from the Commonwealth had been that this project was not required to be referred. BNR has continued to engage with DCCEEW to reiterate that the environmental impacts associated with the Proposal do not result in any direct or indirect mechanisms that would cause a significant impact to matters of NES protected under the EPBC Act.

5.4 Inland waters

5.4.1 EPA objective

To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.

5.4.2 Policy and guidance

- *Rights in Water and Irrigation Act 1914* (WA)
- Environmental Key Factor Guideline – Inland Waters (EPA, 2018)
- Australian and New Zealand Environment and Conservation Council (ANZECC and ARMCANZ, 2018)

- Department of Water – Water Quality Protection Note (WQPN) 26 (liners for containing pollutants, using synthetic membranes) (DoW, 2013)
- Department of Mines and Petroleum and Department of Water – Guideline for groundwater monitoring in the onshore petroleum and geothermal industry (DMP & DoW, 2016).

5.4.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing and procedure of the environmental review, required by Section 40(3) of the EP Act. Table 5-19 lists the ESD requirements specific to inland waters.

Table 5-19: ESD checklist – inland waters

Inland waters		
Required work		**BNR response**
1	Characterise the surface water and groundwater systems in a local and regional context and describe recharge and discharge mechanisms, aquifer connectivity, surface water/groundwater interaction and water chemistry. This should include identification and mapping of groundwater and surface water dependent ecosystems, and detail of the location of wells in relation to surface water features (e.g. Le Lievre Swamp, permanent/semi-permanent pools etc.).	Section 5.4.3
2	Undertake baseline groundwater level and water quality monitoring at representative sites that reflect the expected conditions of each well, including a comprehensive list of analytes including geogenic chemicals, radon and methane concentrations, for a minimum of 24 months prior to commencing the Proposal that is at least consistent with the Guideline for groundwater monitoring in the onshore petroleum and geothermal industry (DMP & DoW, 2016).	Section 5.4.3.3 Appendix M
3	Analyse, describe, and assess surface water and groundwater impacts, including direct, indirect and cumulative impacts, from the project. This should include, but not be limited to: a. changes to groundwater levels and surface water flows associated with the Proposal b. changes to water quality c. the nature, extent, and duration of impacts d. impacts on environmental values of ground and surface water dependent ecosystems.	Section 5.4.5 Section 7.1
4	Discuss the proposed management, monitoring and mitigation to ensure impacts on inland water quality and environmental values are not greater than predicted as a result of implementing the Proposal. This should include but not be limited to: a. ecotoxicology testing on produced or flowback water to better assess the potential impacts b. groundwater level and groundwater quality monitoring plan for the duration of the petroleum development activity and post closure, including concentrations of methane and of chemical constituents that are indicative of brine incursions c. surveillance monitoring of groundwater level and groundwater quality for the duration of petroleum development activity d. testing for, and assessment of the risk from a comprehensive list of analytes in groundwater, likely in produced and flowback water, including geogenic chemicals, technologically enhanced naturally occurring radioactive materials and radon e. a site water balance, accounting for water produced, evaporated, and disposed of, to enable detection of significant leakage of fluids and determine whether remedial action to track any contaminants is warranted f. proposed management of flowback water, including volumes of water that can be expected to be produced. If open air pits are proposed, risks to groundwater and surface water resources arising from leaky pit membranes or other pond failures should be addressed, and the monitoring required to identify and remediate leakages. If re-injection is proposed, the depth of re-injection and detailed construction details of injection wells should be provided.	Section 5.4.6 Appendix E Appendix M
5	Identify all chemicals intended to be used as ingredients in drilling and hydraulic fracture fluids.	Appendix A
6	Provide the Chemical Abstracts Service (CAS) number for the chemicals, and evidence that the chemicals are approved for their intended use in Australia and listed on the: a. Australian Inventory of Chemical Substances (AICS) b. Australian Pesticides and Veterinary Medicines Authority (APVMA) c. Therapeutic Goods Administration (TGA) d. Food Standards Australia and New Zealand (FSANZ) inventories.	Appendix A

Inland waters		
Required work		**BNR response**
7	Provide material safety data sheets (SDS) for the chemicals identified.	Appendix A
8	Confirm whether any chemicals intended to be used contain Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) or Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS).	Appendix A
9	Identify if chemicals proposed to be used are known or suspected carcinogens, mutagens, developmental toxicants, and endocrine disruptors. Use of chemicals with these properties should be minimised or avoided in all operations.	Appendix A
10	Identify the cumulative, short- and long-term public health and environmental risks from chemicals used in drilling and fracturing fluids and chemicals expected to be present in produced and flow-back water.	Section 3.4
11	The Western Australian Department of Health (DoH) should review and provide advice on the information and risk assessments provided for chemicals proposed to be used in hydraulic fracture stimulation or expected to be present in produced or flowback water.	Section 5.8
12	**Geotechnical risks** Undertake and provide a comprehensive geotechnical risk analysis, including: a. definition of subsurface state of stress b. definition of the structural context c. identification of any hydrogeologically active faults or fracture zones d. assessment of well-seal effectiveness e. appropriate expertise f. delineation of potential high-risk zones	Section 5.4.5 Appendix B Appendix T
13	Provide details of an appropriate early warning system mechanism to prevent adverse geo-mechanical events reaching a size of any consequence to land or hydrogeology.	Section 5.4.6 Appendix B
14	**Well Integrity** Well design, construction, stimulation, operation, and decommissioning are all addressed by International Standards Organisation (2017; ISO 165301), which encompasses each phase of the life of any oil and gas well. The Proposal must meet or exceed ISO 165301. The following should be provided: a. details of the well integrity management system over the entire Proposal lifecycle b. a risk assessment process for well barrier integrity, identifying appropriate remedial action should a well barrier be compromised c. details of a well integrity testing and validation program.	Section 1.4.3.2 Section 2.5 Section 5.4.6
15	Provide confirmation that well design, construction, and testing will be assessed by an independent, certified well examiner, reporting to the regulator as a required part of commissioning, licensing, and decommissioning.	Section 5.4.6
16	Demonstrate how the mitigation hierarchy of avoid, minimise, mitigate has been applied during the planning and design stages of the Project.	Section 5.4.6
17	Demonstrate and document in the ERD how the EPAs objective for this factor can be met.	Section 5.4.7
18	**Decommissioning** Include details of the entire life cycle of oil and gas wells, from establishment to decommissioning, including all supporting activities related to hydraulic fracture stimulation. Rehabilitation, decommissioning and well-monitoring post-decommissioning should include evaluating factors such as: a. life cycle of well from establishment to decommissioning b. land use post-decommissioning, developed in consultation with relevant stakeholders c. disposal of contaminated wastes, including the management of potentially radioactive drill cuttings and wastewater in a manner that is consistent with the requirements of the Radiological Council d. storage pond and site rehabilitation e. well-monitoring and groundwater monitoring post-decommissioning to ensure that leakage, fugitive emissions or contamination has not occurred. f. monitoring trigger-levels for intervention and commitment to immediate remediation if contamination is detected.	Section 2.4.5 Section 2.5 Section 2.6 Monitoring Program (Appendix E)

5.4.3 Receiving environment

5.4.3.1 Groundwater systems – regional context

The project area is situated in the Canning Basin region within the Fitzroy River Catchment. The Canning Basin is considered the second largest groundwater resource in Australia after the Great Artesian Basin. It is a large sedimentary basin covering an onshore area >450,000 km^2 (DoW, 2012). The major regional aquifer systems in the Canning Basin are (in order of decreasing age):

- Grant Group
- Liveringa Formation
- Wallal Sandstone
- Broome Sandstone.

The two aquifers considered "useable" for other purposes within the project area include the Liveringa and Grant Group.

5.4.3.1.1 Grant Group

The Grant Group aquifer comprises several subsurface geological structures, including the Reeves Formation (formerly described as the Lower Grant Formation) and the Poole Sandstone, which is directly above the Grant Group.

The Poole Sandstone and Grant Group are considered to be hydrogeologically similar and are both regarded as good aquifers because of their combined thickness and widespread distribution (Lindsay & Commander, 2005). The Poole Sandstone is mainly fine-grained with some medium to coarse sandstone towards the base. The Grant Group is much thicker than the Poole Sandstone. Available salinity records from DWER's Water Information Reporting (WIR) database (DWER, 2021) for the Poole Sandstone range from 200 to 325 mg/L TDS, with 860 mg/L TDS for the Grant Group. In other areas of the Grant Group, oil accumulations are known to occur (hydrocarbons have previously been produced from the Grant Group from the Sundown, Boundary, and West Terrace wells at Blina Oilfield, which is north of the Development Envelope) (Jonasson, 2001).

5.4.3.1.2 Liveringa Formation

The Liveringa Formation comprises interbedded sandstones, siltstones with lenses, and minor beds of claystone and shale, varying in thickness from 320 m–900 m (Harrington & Harrington, 2015). Salinities, where recorded in the WIR database and by the previous operator, are generally <1,000 mg/L TDS in the Liveringa Aquifer but may range from 500–12,400 mg/L TDS (Appendix I (Rockwater, 2016)).

5.4.3.1.3 Wallal Sandstone

The Wallal Sandstone is present in the west and northwest of the Fitzroy River Catchment but has limited outcrop at the land surface due to overlying formations and a veneer of surficial sediments. This sandstone aquifer is likely to host intermediate-scale flow systems, though very little information currently exists other than from drilling around Derby and Mount Anderson (Gallardo, 2018; Smith, 1992). Bore yields can be high in places, with recent investigations reporting bore yields of up to 50 L/second (Stocker, 2015). Groundwater salinity is also fresh in most locations (i.e. TDS of 500–1,000 mg/L). Aquifer pumping tests on the Wallal Sandstone at Mowanjum Station (~95 km northwest of the Development Envelope) estimated a transmissivity of 273 m^2/day and a hydraulic conductivity of 4.8 m/day. Buru Energy (2012) reports a hydraulic conductivity for the Wallal Sandstone of 44 m/day.

5.4.3.1.4 Broome Sandstone

The Broome Sandstone aquifer is the principal groundwater resource in the West Kimberley (specifically for the Dampier, Broome, and La Grange areas) used for irrigation, stock and domestic supply. Within the Canning Basin, the Broome Sandstone is an extensive, flat-lying aquifer, coarsening with depth, with some siltstone layers and a saturated thickness of up to 200 m near the coast. Generally, the sandstone has high porosity, and bores screened within it are capable of producing up to 60 L/s of low salinity (Paul, George, & Gardiner, 2013). Salinity values for bores located within the Broome Sandstone indicate that TDS values decrease the further inland they are located. Of the 115 bores analysed from the WIR database, 43 bores

had a TDS below 500 mg/L, 33 bores had a TDS between 500 and 1,000 mg/L, and the remaining 39 bores had a TDS above 1,000 mg/L (Paul, George, & Gardiner, 2013).

5.4.3.2 Groundwater systems – localised context

Data from three petroleum wells drilled on EP 371 by the previous operator (Table 5-20) provides a two-dimensional cross-section of the aquifers located within the permit, as shown in Figure 5-16.

A detailed summary of these aquifers with reference to local data is provided in the following sections, and Appendix T outlines additional information regarding key geological intervals through the various aquifers.

Table 5-20: Local aquifer data

Formation	Dominant lithology	Classification	Elevation – base of formation (m AHD)			Thickness (m)	TDS (mg/L)
			Valhalla 2	Valhalla North 1	Asgard 1		
Liveringa	Carbonate and shale	Minor aquifer, aquitard	−84	−196	−171	84–196 m	500–12,400
Noonkanbah	Shale	Aquiclude	−441	−635	−579	357–439 m	550–800
Poole Sandstone	Sandstone and shale	Aquifer or aquitard	−524	−715	−695	80–116	300
Grant Group	Sandstone	Aquifer	−1,332	−1,499	−1,240	545–808	800–1,000
Reeves	Sandstone	Aquifer	−1,588	−1,826	−1,606	270–366	No data
Anderson	Sandstone, siltstone, shale	Minor aquifer, aquitard	−1,858	−2,105	−1,790	184–279	70,000–100,000
Laurel	Limestone, shale, siltstone, and sandstone	Minor aquifer, aquitard	<−3,350	<−3,241	<−3,400	1,136–1,610	70,000–100,000

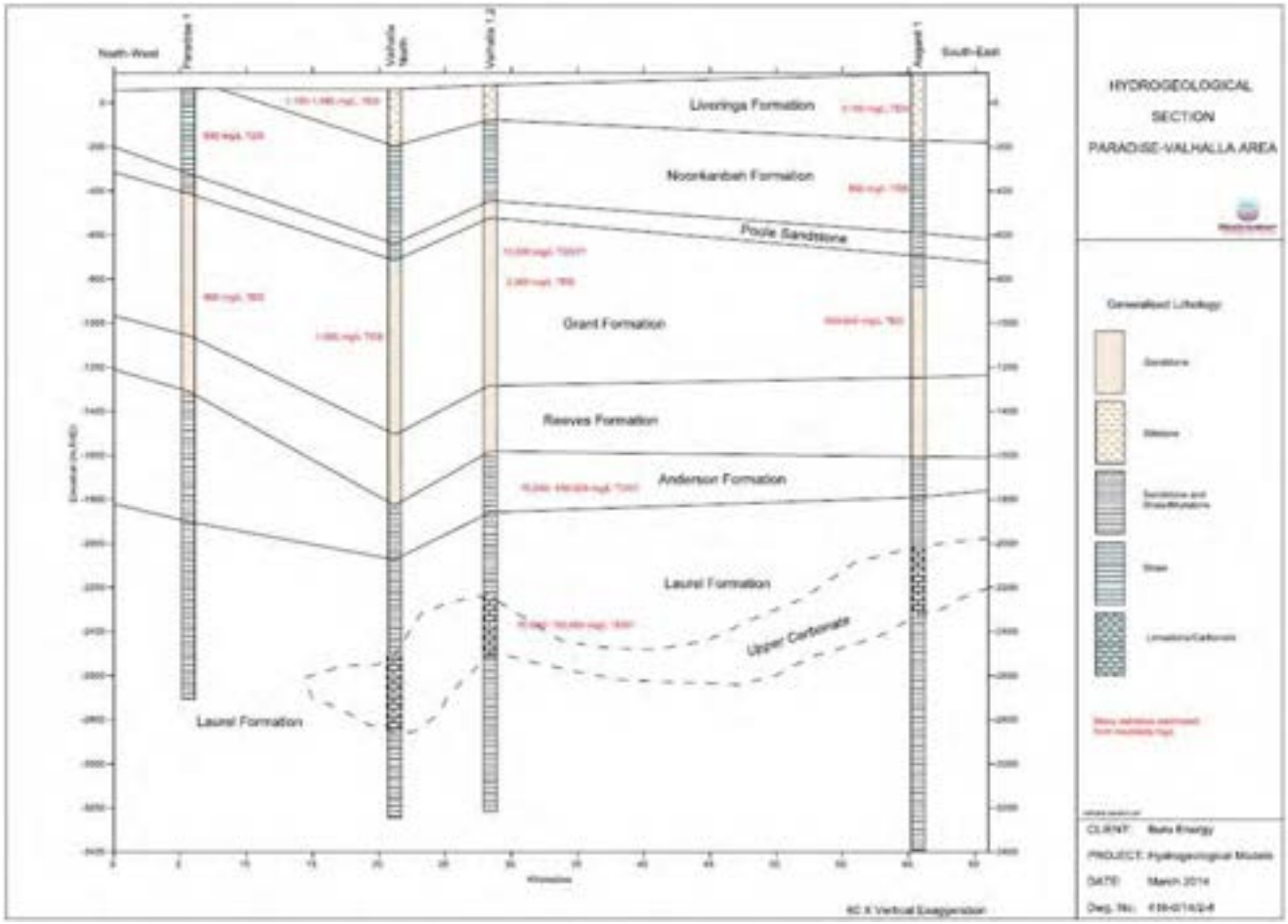

Figure 5-16: Hydrogeological cross-section

Although Figure 5-16 is a simplified cross section of the Development Envelope however, presentation of subsurface data this way is appropriate given the availability of three key wells with modern logs – Valhalla-1, Valhalla-N-1, and Asgard -1. BNR acknowledges presentation of this data is limited given the absence of regional sand/shale ratios other than in principally in two dimensions. A more detailed cross section of the subsurface geology is presented in Appendix T (Figure 2).

In addition to cross sections, semi-regional isochore (based on seismic data tied to wells) maps of key geological intervals along with the proposed locations have also been included in Appendix T (Figures 1a-Figure1e). The figures presented therein show the intervals that represent the isochores and associated stratigraphy highlighted. These figures are focused on the Poole aquifer unit (a deltaic sandstone) as well as the non-aquifers of the Grant Group and Anderson formations. For the Grant group Formation, the overall thickness within the development area is between 545m-808m. The deepest interval (Anderson) does thin updip but over most of the Development Envelope it is over 150m thick.

The shallowest interval that likely contains potentially economic hydrocarbons is located at 2600m to the top of the Grant Formation. Semi regional isochore figures (Appendix T) indicate there is 900m - 1800m of section between the shallowest potential HFS zone (2600m) and the Grant/Winfred Formation top (Base of the Poole).

5.4.3.3 Liveringa Aquifer

5.4.3.3.1 Recharge and discharge mechanisms

Groundwater recharge to the Liveringa Aquifer is believed to be mainly from rainfall on outcrop areas (Lindsay & Commander, 2005). During the Fitzroy River integrated ground and surface water hydrology assessment conducted between 2008 and 2011, monitoring of the Liveringa Aquifer and surface alluvial

waters associated with the Fitzroy River indicated a strong connection between the river and the aquifer. This project was led by the then WA Department of Water (DoW) with funding provided by National Water Commission under the Raising National Water Standards (RNWS) program. The multilevel piezometers that were installed at three sites on Noonkanbah Station as part of the DoW and RNWS project showed a groundwater response to high river flow events (Lindsay & Commander, 2005). This, and comparatively low groundwater salinities measured in these piezometers compared with other regional bores, suggests some recharge to the aquifer by floodwaters.

Infiltration to the Liveringa Formation (and subsequent aquifers) from rainfall will be retarded by clay, shale and siltstone layers, both above and below the water table. Water is likely to take 70–300 days to travel from the ground surface to the water table within the Development Envelope (Appendix I (Rockwater, 2016)).

5.4.3.3.2 Aquifer connectivity (surface water/groundwater interaction)

As detailed in Table 5-20 and shown in Figure 5-16, the Liveringa Aquifer and Poole Sandstone (associated with the Grant Group) are separated by the Noonkanbah (shale) Formation. The Noonkanbah Formation is considered an aquitard, comprising siltstone, limestone and minor sandstone (Lindsay & Commander, 2005), and it is a geological barrier (at least 357 m thick) between the Liveringa and Poole Sandstone aquifers. Consequently, within the Development Envelope the surface aquifer (Liveringa) is geologically separated from the Poole Sandstone (and subsequently, the targeted Laurel Formation).

5.4.3.3.3 Water chemistry

BNR has developed a series of groundwater studies to inform and support both the environmental impact assessment within the PER and the ongoing monitoring and management of groundwater during the Proposal. Table 5-21 summarises each study.

Table 5-21: Groundwater field studies

Field study	Timing	Project Phase	Relevant Document – Sampling Design
GW1 – Local groundwater characterisation	Before 2021	Environmental approvals	PER
GW2 – Baseline monitoring - Upgradient control site monitoring	Before the project commences, and continuing until project completion	Pre-development, appraisal, post-development	Part IV EMP
GW3 – Surveillance monitoring	At least 6 months before well activity commences, and continuing until site-specific termination criteria are met	appraisal, post-development	Part IV EMP

The purpose of the PER local groundwater characterisation field study was to review the quality of the Liveringa Aquifer within the Development Envelope using historical groundwater data. The local groundwater characterisation study focused on several bores near the project area, namely:

- AB1D
- AB1S
- VNB4S
- VNB4D.

These bores were considered suitable for providing appropriate historical baseline data because:

- AB1D, AB1S, VNB4S and VNB4D are located up-gradient of previous historical petroleum activities conducted in EP 371 (Figure 5-28)
- these four are screened within the Liveringa Aquifer and although the bore logs are not available for the monitoring bores schematics are available for these bores (Figure 5-29)
- BNR validated bore schematics placing a camera down hole in July 2023. All four were shown to be intact and suitable for the purposes of collecting baseline groundwater samples. Details of this assessment, as well as photos from the down hole camera, form part of Appendix G. A summary of these recordings is:

- AB1S
  - stick-up: 0.5 m
  - standing water level: 23.070 metres below top of casing (m btoc)
  - screened interval: 30.8-36.3 m btoc
  - bottom of casing: 36.3 m btoc
  - some white build-up on lower ~5 m of casing walls
- AB1D
  - stick-up: 0.7 m
  - standing water level: 21.780 m btoc
  - screened interval: 67.0-76.6 m btoc
  - bottom of casing: 76.6 m btoc
  - ant ingress and some ant material build-up on walls from 20 m btoc
- VNB4S
  - stick-up: 0.5 m
  - standing water level: 30.686 m btoc
  - screened interval: 36.6 m btoc
  - bottom of casing: 42.3 m btoc
  - no or minor build-up on casing walls
- VNB4D
  - stick-up: 0.7 m
  - standing water level: 30.956 m btoc
  - screened interval: 66.9-78.3 m btoc
  - bottom of casing: 78.4 m btoc
  - minor build-up on casing walls

- VNB4S / VNB4D and AB1D / AB1S are located on the northwest and southeast of the proposed disturbance footprint respectively (Figure 5-30), thus providing geographical coverage across the project area
- groundwater flow is westerly (Figure 5-30), thus providing water quality at different hydrogeological gradients.

The local groundwater characterisation study on the four bores into the Liveringa was undertaken over five years (two of the four bores continued to be monitored for a further two years). The number of sampling events undertaken at each bore location and the data results are detailed in Appendix J. BNR has mapped specific CoPC over the sampling period in Figure 5-17 to Figure 5-27. The CoPC selected to be presented here are relevant because they are the indicator constituents used to determine if any release from petroleum activities (including drilling or HFS fluids) has occurred. These are consistent with those identified by the 'Groundwater Monitoring in the onshore petroleum and geothermal industry – Guideline' (DMP & DoW, 2016).

Except for the April 2016 sampling event, long-term data analysis indicates that groundwater chemistry influenced by the geology is stable.

Table 5-22: Summary of groundwater monitoring bores sampled

Location	Bore name	Number of sampling events	Total sampling duration
Asgard 1 well site	AB1D	23	>5 years
	AB1S	23	>5 years
Valhalla North 1 well site	VNB4D	21	>5 years
	VNB4S	21	>5 years

Figure 5-17 to Figure 5-27 show data from ongoing monitoring of bores in the Liveringa Aquifer in accordance with Buru Energy's and BNR's *Groundwater Baseline and Surveillance Monitoring Program*. One anomalous reading can be seen across all tested elements from VNB4S from samples taken on 19 April 2016. The causes of the anomalous results were immediately examined. BNR determined that that:

i) The VNB4S water bore was the reference bore located upstream of the wellsite, so the cause of the result was highly unlikely to be attributable to historical subsurface activities; and

ii) The VNB4S water bore was the first bore sampled on that day and it was possible that the bore pump and hose had not been adequately purged prior to sampling commencing.

A resampling of the bore was subsequently undertaken on 10 May 2016. When tested by SGS Australia, it showed that the range of values for BTEX, chloride and other constituents were within the range of values previously observed. During the development of this document, BNR engaged with DWER to discuss these outcomes and BNR came to the decision that the anomalous reading would not impact baseline groundwater data.

Baseline methane levels within the Liveringa indicate some natural variation, however it is otherwise considered stable. As detailed in Figure 5-27, increased methane concentrations were recorded in 2018 and 2019 before sampling in 2021 indicated levels had returned to baseline levels. On further investigation, all bores sampled in this area between 2018 and 2019 experienced an increase in methane levels, including those bores located hydraulically upgradient (in consultation with DWER (AB1D/S and VNB4D/S)) in a location that would enable the previous operator to differentiate between activity-related and natural occurring events. This area experienced, flood events followed by heatwaves in 2018, resulting in mass cattle death across the Noonkanbah Station. As the Liveringa is believed to be mainly recharged from rainfall on outcrop areas (Lindsay & Commander, 2005) it is likely that these events caused increased organics through surface recharge which produced the increased dissolved methane readings. Additional constituent analysis has determined this is not associated with the previous operator's activities.

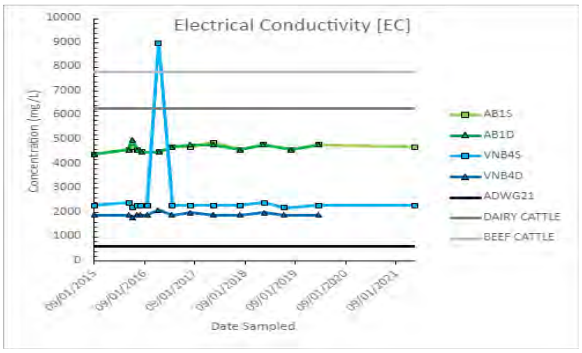

Figure 5-17: Electrical conductivity [Liveringa]

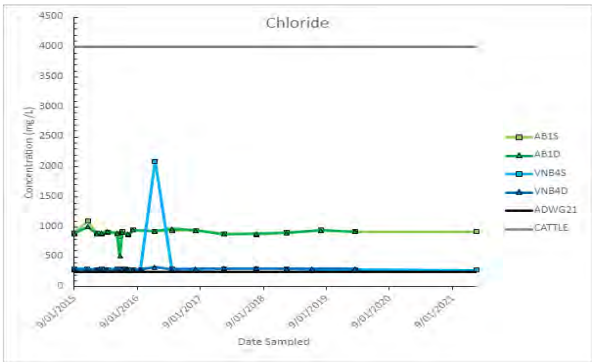

Figure 5-18: Chloride [Liveringa]

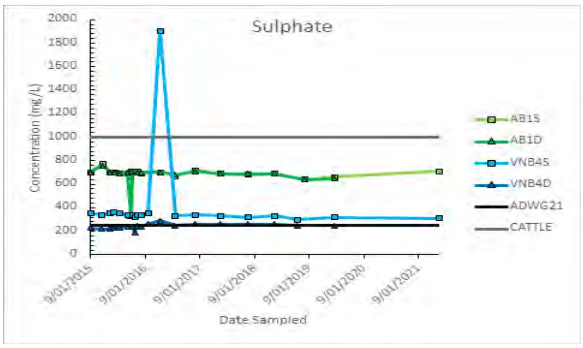

Figure 5-19: Sulfate [Liveringa]

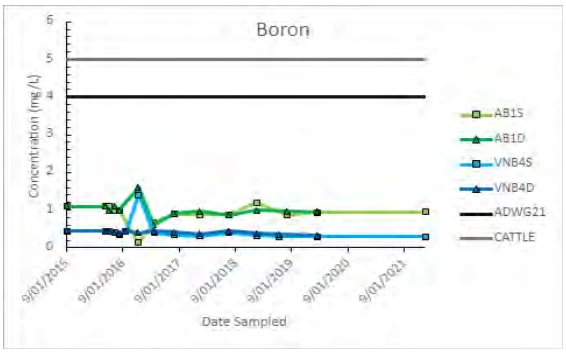

Figure 5-20: Boron [Liveringa]

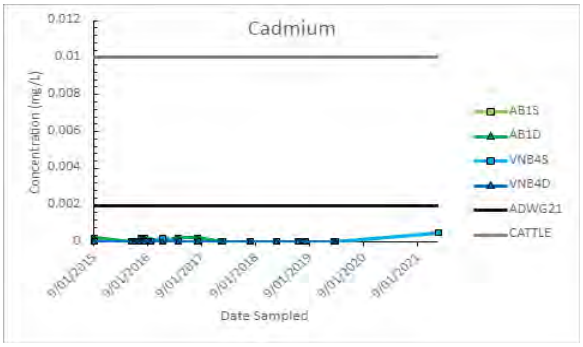

Figure 5-21: Cadmium [Liveringa]

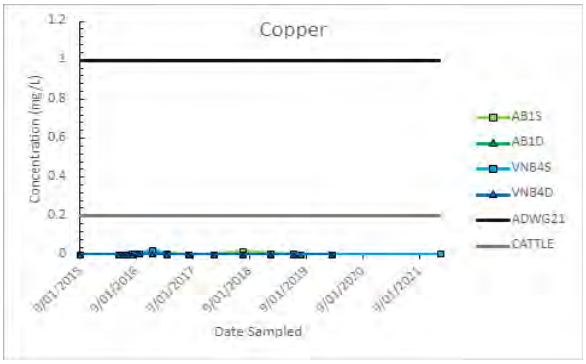

Figure 5-22: Copper [Liveringa]

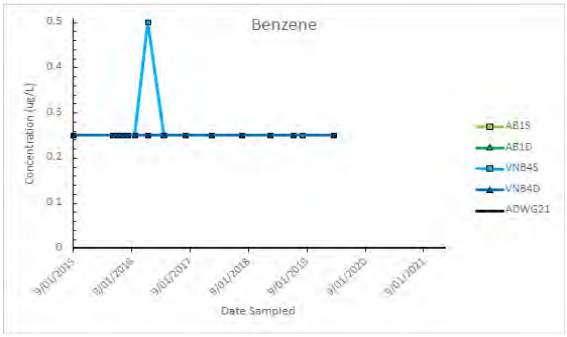

Figure 5-23: Benzene [Liveringa]

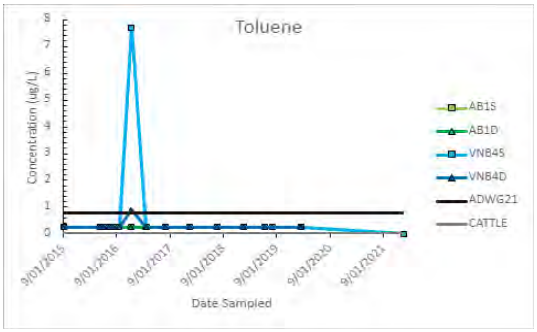

Figure 5-24: Toluene [Liveringa]

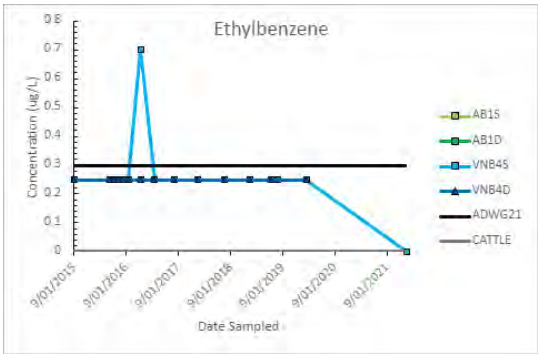

Figure 5-25: Ethylbenzene [Liveringa]

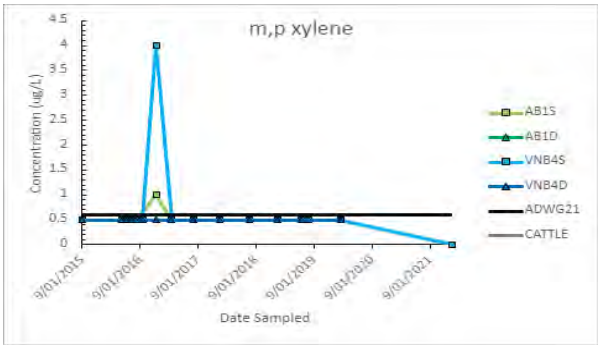

Figure 5-26: Xylene [Liveringa]

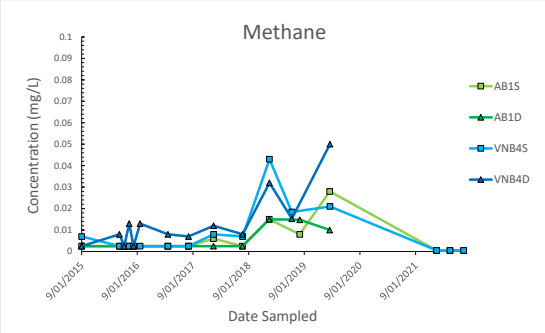

Figure 5-27: Methane [Liveringa]

Figure 5-28: Location of VNB4S / VNB4D and AB1D / AB1S and proximity to existing infrastructure

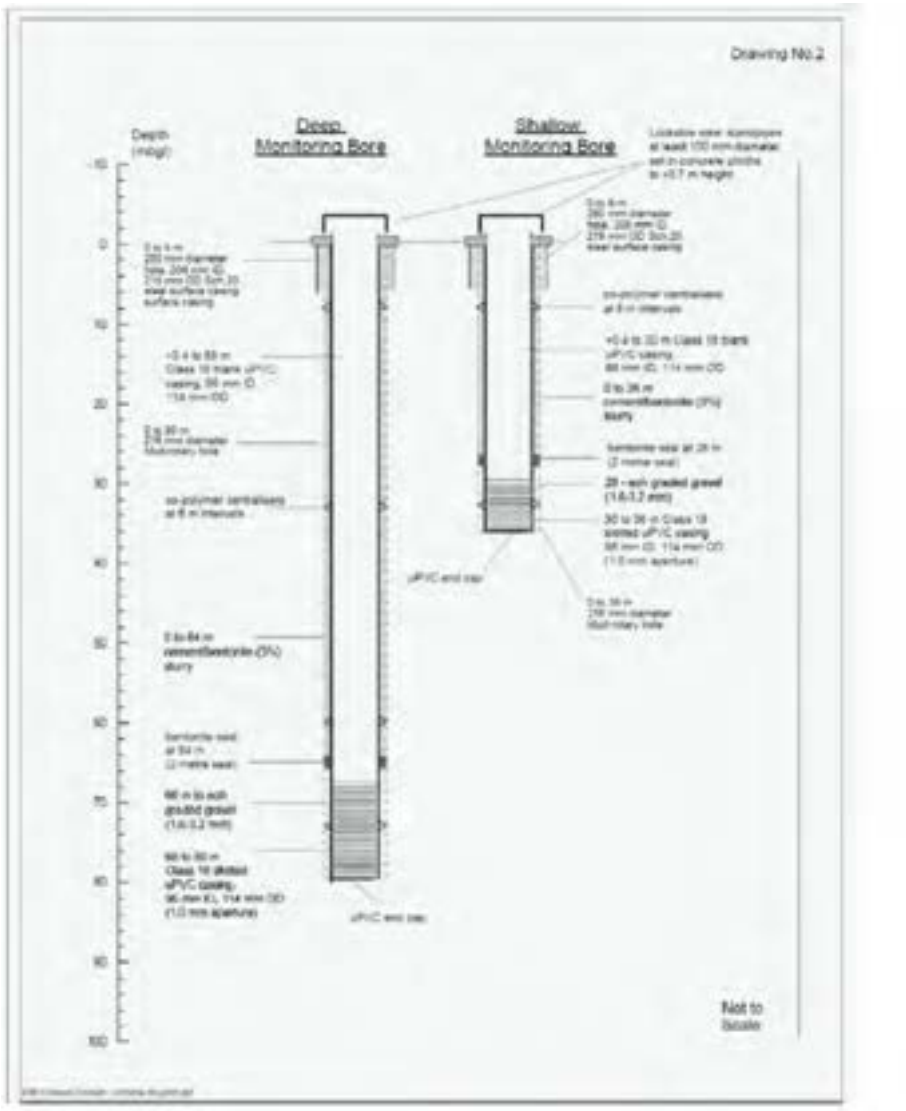

Figure 5-29: Schematic of the Asgard and Valhalla North groundwater monitoring bores

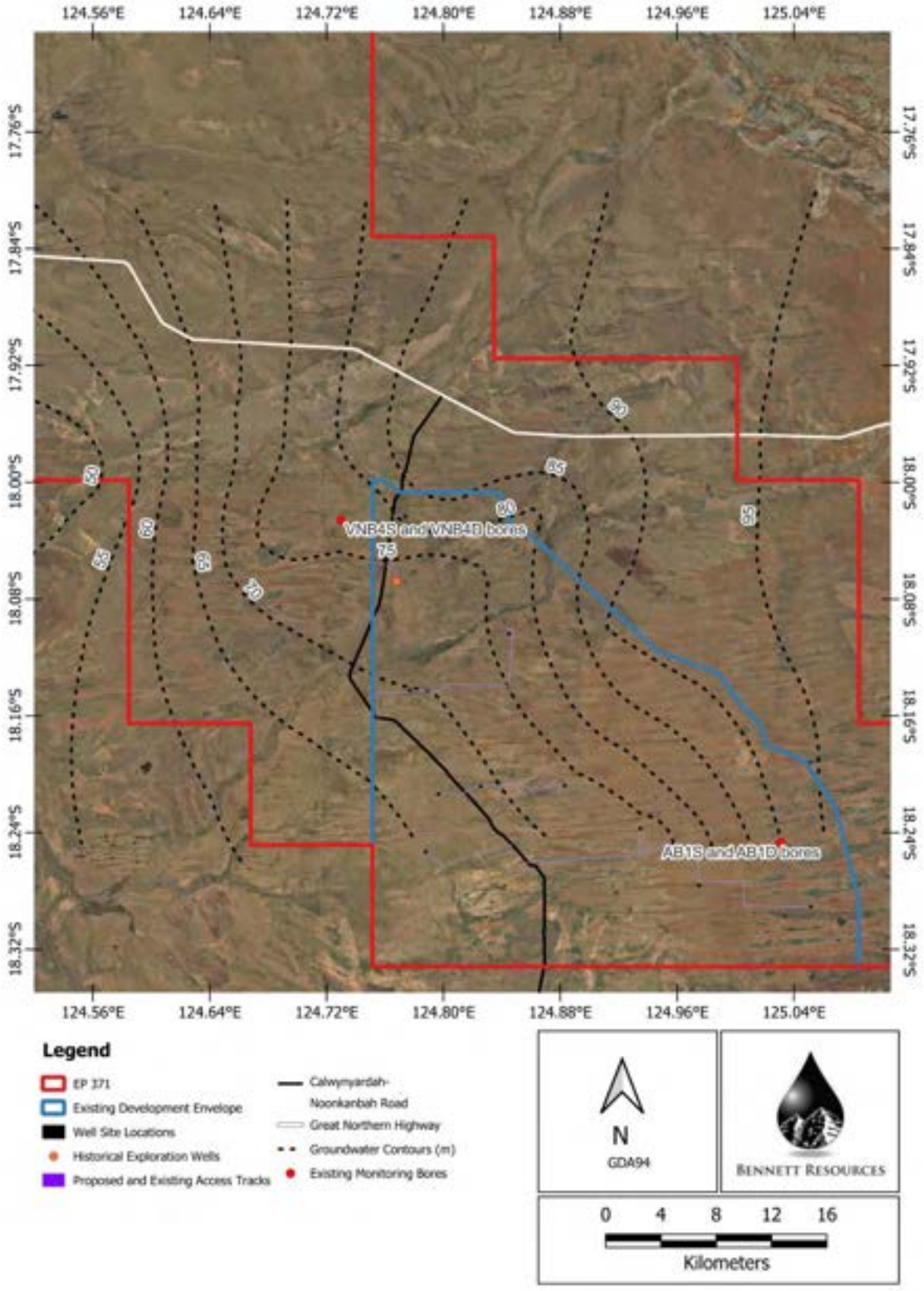

Figure 5-30: Location of Liveringa groundwater sampling bores for local groundwater characterisation and groundwater contours

5.4.3.3.4 Local and regional use

Groundwater is used for licensed and unlicensed water extraction in the region. Unlicensed extraction is likely to include domestic and stock watering, both of which extract relatively minor volumes of groundwater. In accordance with the RIWI Act 1914, DWER allocates water use via groundwater licences within the sustainable volume available for a groundwater resource. DWER has determined that the Canning–Kimberley groundwater area has an allocated limit of >300,000 ML/year (DoW, 2014), of which only 0.9 GL (4.3%) is licensed within the Liveringa Aquifer (Harrington & Harrington, 2015).

A search of DWER's Water Register licensing database (DWER, 2021) for licensed users within the Development Envelope identified only one other water licence targeting the Liveringa, as detailed in Table 5-2320. BNR currently has three groundwater licences but has extracted little to no water during the yearly care and maintenance program for its assets on EP 371. Although most of the water extraction within the broader region is licensed, unlicensed water use of the Liveringa Aquifer does occur, including for livestock bores (pastoral activities) (Harrington & Harrington, 2015). The nearest groundwater user outside the project area is the Yungngora Community, ~18 km south. However, unlicensed groundwater extracted for community bores is typically from deeper aquifers.

A review of existing pastoral bores was undertaken to understand the distance from the Proposal's disturbance footprint. Based upon publicly available information, currently operating pastoral bores are at least 1.5 km from the disturbance footprint. These bores are only used for stock watering purposes with no irrigation, human consumption or other purposes identified.

Table 5-23: Summary of groundwater extraction licences within the Development Envelope that target the Liveringa Aquifer

Licence number	Issue date	Expiry date	Allocation (ML)	Owner
174685	05 Oct 2020	04 Oct 2030	309	Main Roads Department
167493	07 Jan 2021	10 Sep 2023	30	Bennett Resources Pty Ltd
179134	07 Jan 2021	10 Sep 2023	33.4	Bennett Resources Pty Ltd
179166	07 Jan 2021	10 Sep 2023	39.4	Bennett Resources Pty Ltd

5.4.3.4 Poole Sandstone (Grant Group)

The Poole Sandstone is considered part of the Grant Group—therefore, BNR has focused on the Poole Sandstone as the key aquifer of importance from the Grant Group.

5.4.3.4.1 Recharge and discharge mechanisms

Recharge to the Poole Sandstone occurs at the aquifer outcrops and shallow sub crops in the centre of the catchment following intense wet season rainfall. Recharge rates are estimated between ~13 and 70 mm/year (Taylor, et al., 2018). Interpretation of environmental tracers in groundwater, particularly carbon-14 and Terri genic helium-4, indicate long residence times for the Poole Sandstone aquifer. Mean residence times of >30,000 years were estimated for several groundwater samples collected from very deep parts of the aquifer (>500 m) at distances as short as 10 km from their outcrop or sub crop. Elsewhere, the aquifers are confined by the Noonkanbah Formation (Harrington & Harrington, 2015).

Infiltration to the Poole Sandstone within the Development Envelope is not expected because the Noonkanbah Formation (a shale aquitard) overlies this formation. No outcrops or shallow sub crops are known to occur within the Development Envelope. This is consistent with Figure 5-31, which indicates that the Poole Sandstone is shallower both east and west of the Development Envelope.

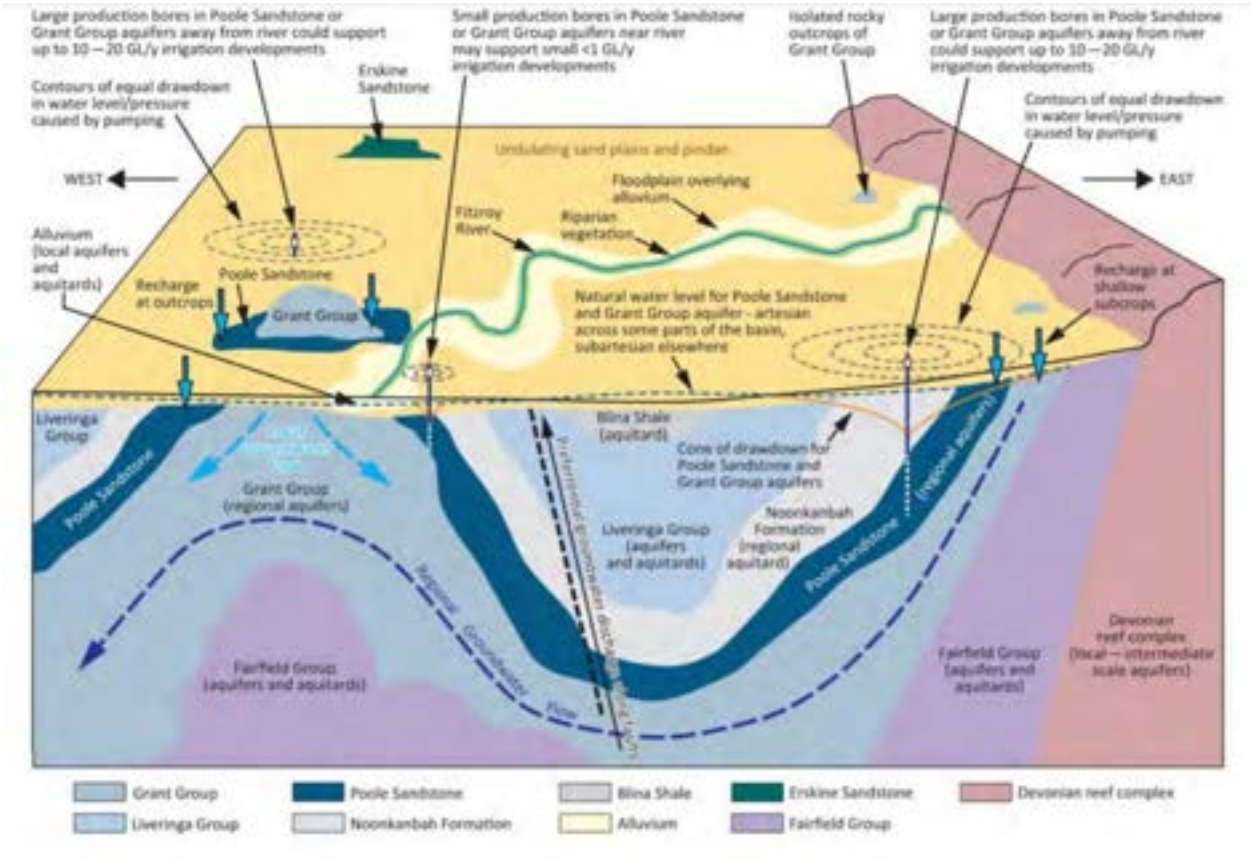

Figure 5-31: Conceptual schematic diagram of the regional groundwater flow process and positioning of the Poole Sandstone (taken from Figure 5-3 in (Taylor, et al., 2018))

5.4.3.4.2 Aquifer connectivity (surface water/groundwater interaction)

As detailed in Table 5-20, the Liveringa and Poole Sandstone aquifers are separated by the Noonkanbah shale Formation. The Noonkanbah Formation is considered an aquitard, comprising siltstone, limestone and minor sandstone (Lindsay & Commander, 2005), and is a geological barrier (at least 357 m thick) between the Liveringa and Poole Sandstone aquifers. Beneath the Grant Group, the Anderson Formation comprises a shale layer that acts as a confining seal between the Grant and lower formations (such as the targeted Laurel Formation). The Anderson Formation provides a geological barrier that is between 184 m and 279 m thick.

5.4.3.4.3 Water chemistry

BNR has developed a series of groundwater studies to inform and support both the environmental impact assessment within the PER and the ongoing monitoring and management of groundwater during the Proposal. Given the depth to the Poole Sandstone (-571 m) and the confinement of the Poole Sandstone within the Development Envelope, BNR used water quality data from groundwater users that are both licensed and unlicensed to extract groundwater from the Poole Sandstone, including the Yungngora Community and the town of Fitzroy Crossing.

BNR has been provided with data from the Yungngora Community's YG2/18 bore, which was constructed in 2018. The bore completion log for the Yungngora Community indicates that the total depth of the bore is 497 m and screens were installed between 398 and 497 m below ground level (Figure 5-32) (Australian Bore Consultants, 2019).

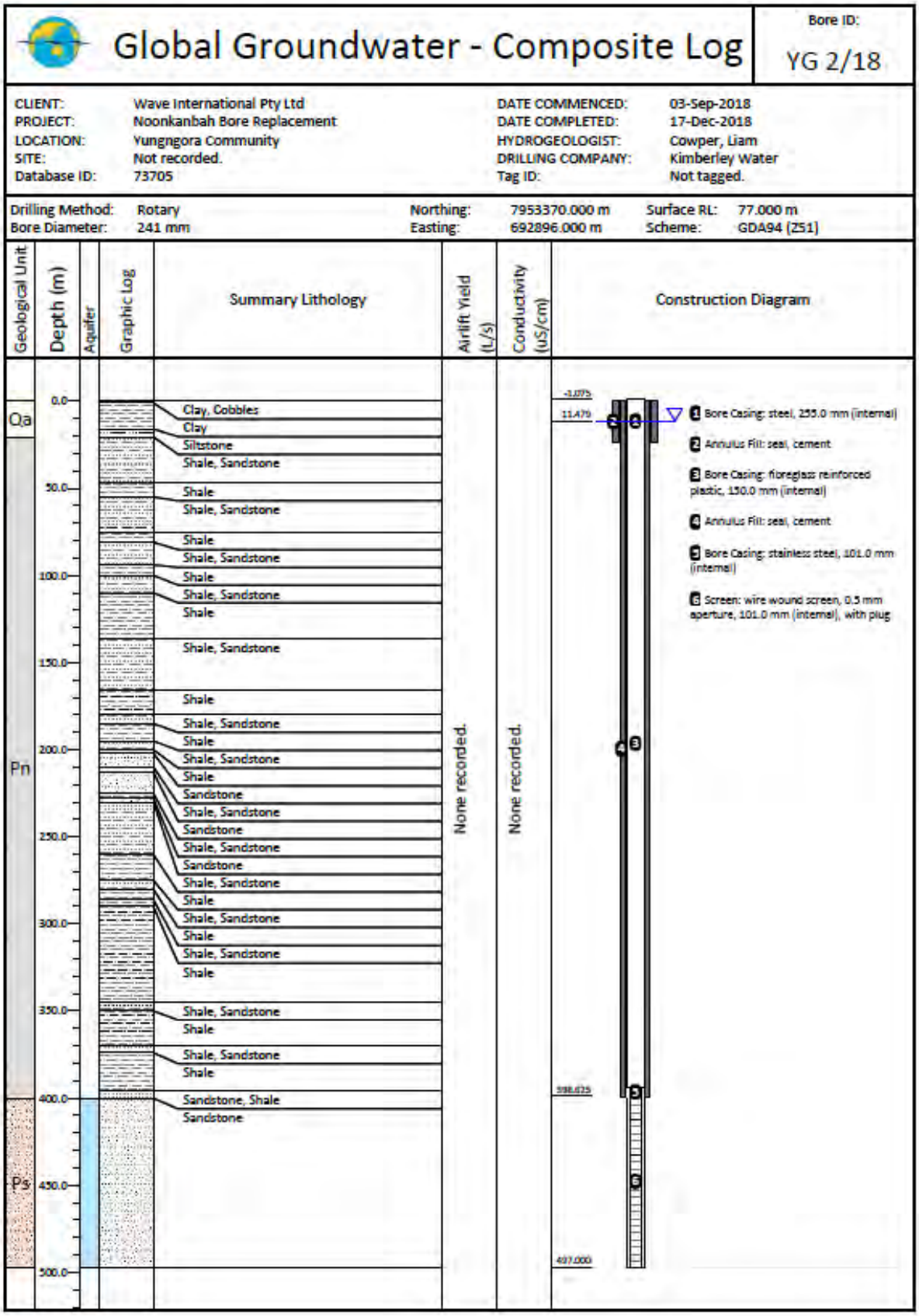

Figure 5-32: Drilling log of the YG2/18 bore

Data is collected from this bore as part of a larger monitoring program with all data tested and reported separately. Water quality data available for YG2/18 between April 2018 and April 2023 was reviewed to better understand the water chemistry of the Grant Group within the Development Envelope. All of the components tested from YG2/18 (for example, fluoride, chloride, nitrate, sulfate, sulfur, etc) are lower than acceptable levels (from an aesthetic perspective), with two exceptions. In April 2023, total dissolved solids were 820 mg/L (aesthetic acceptable level is 600), and sodium levels are higher than the aesthetic acceptable level of 180 mg/L on several occasions. For example, in April 2023 sodium levels were 250 mg/L, in November 2022 they were 220 mg/L and in April 2021 they were 190 mg/L. Water quality data for YG2/18 bore is included as Appendix K .

Table 5-24: Yungngora Community Bore (Grant Group) groundwater quality (Appendix K)

Parameter	Bore YG2/18	
	Minimum–Maximum	Median
Conductivity at 25 °C (mS/m)	890-990	*930*
Turbidity (Nephelometric turbidity unit)	0.1-0.2	*0.1*
pH (pH units)	7.6-8.6	*8.3*
Aluminium	0.04-0.22	*0.2*
Barium	0.03-0.04	0.03
Boron	0.001-0.27	0.01
Fluoride	0.5-0.9	*0.6*
Iron	0.02-0.15	*0.03*
Manganese	0.030-0.042	*0.040*
Nitrate as nitrogen	0.0-0.1	*0.0*
Nitrite as nitrogen	0.05	*0.05*
Uranium	0.001	

A summary of data for key CoPC for the Poole Sandstone monitored at Fitzroy Crossing is provided below in Table 5-25. Comparing the Yungngora Community and Fitzroy Crossing data, the data indicates that the Poole Sandstone overall produces fresher water than the Liveringa Aquifer, as demonstrated by lower chloride concentrations and lower EC/TDS. Sulfate concentrations within the Poole Sandstone were also substantially less that those observed in the Liveringa, but cadmium and copper concentrations were comparable. Long-term data analysis indicates that groundwater chemistry influenced by the geology is stable within the Poole Sandstone.

The town of Fitzroy Crossing sources water from the Fitzroy Crossing Water Reserve PDWSA. These production bores are located in hard cemented sandstone on joints or faults within the Poole Sandstone. The production bores range from ~30–60 m deep (DoW, 2008). Table 5-25 lists the water quality of this groundwater source (range and median values, all in mg/L unless stated otherwise). Figure 5-32 shows the location of the Grant Group bores discussed in this ERD.

Table 5-25: Fitzroy Crossing groundwater quality (DoW, 2008)

Parameter	Bore 3	
	Minimum–Maximum	Median
Conductivity at 25 °C (mS/m)	37–50	*42*
Turbidity (Nephelometric turbidity unit)	<0.1–6.6	*<0.1*
pH (pH units)	6.75–7.07	*6.91*
Aluminium (unfiltered)	<0.008–0.67	*<0.008*
Barium	0.095	
Boron	0.1	
Dieldrin	<0.001–0.02	*0.008*

Parameter	Bore 3	
	Minimum–Maximum	Median
Fluoride	0.2–0.25	*0.25*
Iron (unfiltered)	<0.003–0.34	*<0.003*
Manganese (unfiltered)	<0.002–0.065	*<0.002*
Nitrate as nitrogen	0.63–0.75	*0.7*
Nitrite as nitrogen	<0.002–0.005	*<0.002*
Uranium	0.001	

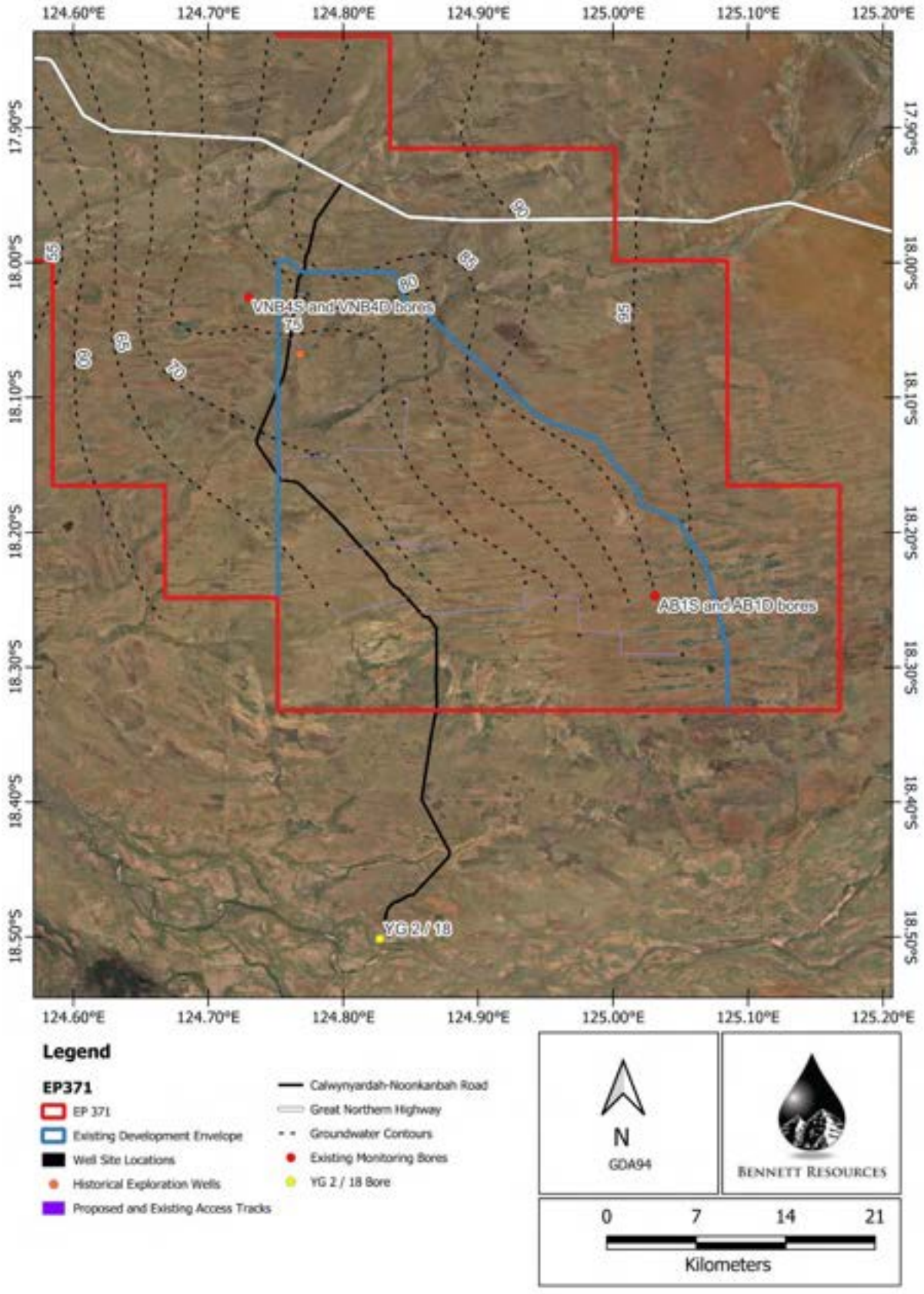

Figure 5-33: Location of Grant Group sampling bore for local groundwater characterisation

5.4.3.4.4 Local and regional use

Within the broader Canning–Kimberley area, the Grant Group comprises ~13.6 GL (67.4%) of the total water allocation within the proclaimed groundwater area (>300,000 ML/year (DoW, 2014)). Although there are multiple licences to take water from within the Grant Group (including from the Poole Sandstone), these are associated with other oil and gas operators, mining operators, Main Roads, communities, and the local shire. Some water extraction within the broader region is unlicensed for uses such as livestock and domestic bores (pastoral activities), tourist activities and Aboriginal community bores (Harrington & Harrington, 2015).

Table 5-26 summarises the groundwater extraction licences within the Grant Group, near the Development Envelope. Locally, there are three known users of groundwater from the Poole Sandstone, near the Development Envelope—the Yungngora Community, and the towns of Camballin and Fitzroy Crossing.

The known locations of pastoral bores within the Development Envelope are plotted on Figure 5-34. The nearest pastoral bore is located at least 1.5 kilometres away from any proposed groundwater abstraction points (well sites).

Table 5-26: Summary of groundwater extraction licences within the Grant Group, near the Development Envelope

Licence number	Issue date	Expiry date	Allocation (ML)	Owner	Targeted aquifer	Proximity to the Development Envelope
181107	04 Jun 2021	15 Jan 2027	10	Buru Energy Pty Ltd Origin Energy West Pty Ltd	Grant	Covers the Development Envelope and EP 371 entirely. No known extraction bores operating within the Development Envelope
165723	14 Sep 2020	13 Sep 2030	99	Main Roads	Grant	~9.5 km east of Proposed Well Site 4; ~9.5 km north of Nidavellir
65339	18 Oct 2018	12 Nov 2024	50	Water Corporation	Grant	~65 km west of Nidavellir
65334	23 Jul 2019	23 Jan 2027	300	Water Corporation	Grant	~58 km east of Proposed Well Site 4
111188	06 Apr 2017	05 Apr 2027	30	Jarlmadangah Burru Aboriginal Corporation	Grant	~85 km west of Nidavellir
175441	03 May 2017	28 Feb 2022	25	New Standard Onshore Pty Ltd	Grant	~72 km south of Proposed Well Site 3
175572	03 May 2017	28 Feb 2022	0.15	New Standard Onshore Pty Ltd	Grant	~72 km south of Proposed Well Site 3
177201	20 Jun 2013	30 Jun 2022	4.5	Kunawarritji Aboriginal Corporation	Grant	~72 km south of Proposed Well Site 3
179509	14 May 2021	13 May 2031	15.5	WA Department of Education	Grant	~58 km east of Proposed Well Site 4
179757	12 Jan 2015	11 Jan 2025	5.475	SDWK	Grant	~58 km east of Proposed Well Site 4
179796	18 Sep 2014	17 Sep 2024	0.35	New Standard Onshore Pty Ltd	Grant	~72 km south of Proposed Well Site 3
200028	28 Jun 2017	27 Jun 2027	2	India Bore Diamond Holdings Pty Ltd	Grant	~25 km north of Nidavellir
200952	19 May 2019	20 Feb 2028	10	Gibb River Diamonds Limited	Grant	~52 km north of Nidavellir
201114	19 May 2019	27 Mar 2028	350	Gibb River Diamonds Limited	Grant	~52 km north of Nidavellir
205296	22 Dec 2020	19 Sep 2024	1.5	West Kimberley Diamonds Pty Ltd	Grant	~65 km north-northwest of Nidavellir

Licence number	Issue date	Expiry date	Allocation (ML)	Owner	Targeted aquifer	Proximity to the Development Envelope
206454	12 Oct 2021	11 Oct 2032	50	Burgundy Diamond Mines Limited	Grant	~43 km north-northeast of Nidavellir

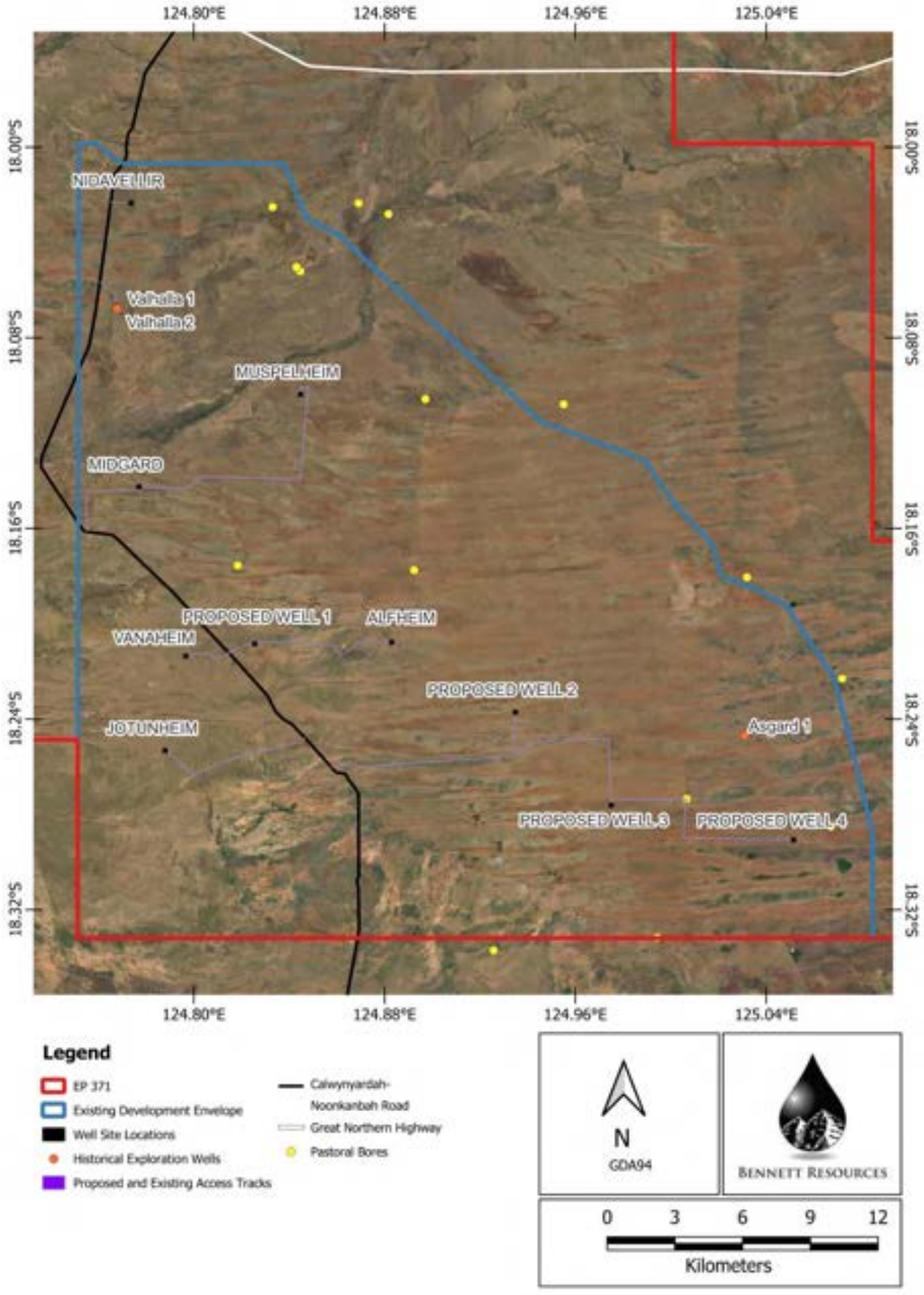

Figure 5-34: Location of known pastoral bores within the Development Envelope

5.4.3.5 GDEs

Knowledge of groundwater dependent ecosystems (GDE) within the Fitzroy River Catchment is limited and a search of the Groundwater Dependent Ecosystems Atlas (BoM, 2021) for GDEs within the Development Envelope indicates that, with the exception of Mount Hardman Creek, no other aquatic or terrestrial GDEs are present near the project area (Figure 5-36).

Mount Hardman Creek comprises limestone tableland and intricately dissected bevelled ridges; separated by plains and rocky karst surfaces with box valleys (BoM, 2021). The creek is non-perennial and only flows following large rainfall events. This indicates that, conceptually, groundwater influence is limited to maintaining areas of isolated surface water expressions until rainfall events result in the connection of surface waters and the creek flows.

FitzCAM—a community group comprising representatives from the key Traditional Owner groups of the Fitzroy River Catchment, pastoralists, irrigators, recreational fishers and catchment residents—developed a draft table of assets known to be water-dependent features (Harrington & Harrington, 2015). These assets included:

- Lake Gladstone, the largest permanent freshwater wetland in the Central Kimberley bioregion, providing a refuge for vulnerable species
- freshwater springs such as Udialla Springs and Honeymoon Springs
- Mallallah Swamp and Sandhill Swamp, which are potentially important waterbird habitats.

In addition, a review of Wetlands of National Significance (DAWE, 2001) was conducted under the Northern Australia Sustainable Yields Project in 2008, which identified that the Camballin Floodplain (Le Lievre Swamp System) and Geikie Gorge were ecologically important where changes in flow regimes occurred (Harrington & Harrington, 2015).

Table 5-27 lists the Development Envelope's distances to these ecological sensitivities, bearing in mind that the distance to the actual proposed disturbance footprint will be greater than these distances.

Table 5-27: Distance of the Development Envelope to water-dependent features

Feature	Distance and direction from the Development Envelope
Mallallah Swamp	~9 km south
Sandhill Swamp	~30 km southwest
Camballin Floodplain (Le Lievre Swamp System)	~38 km west/northwest
Geikie Gorge	~70 km east
Honeymoon Springs (fresh water)	~78 km west
Udialla Springs (fresh water)	~114 km west
Lake Gladstone	~177 km northeast

As detailed in Section 5.4.5.1, the Proposal will not interact with wetlands detailed in Table 5-27, nor are they located within the Development Envelope. As such a conceptual hydrogeology for wetlands detailed in Table 5-27 is not presented.

5.4.3.6 Surface waters

The Development Envelope does not intersect any Ramsar wetlands or Wetlands of National Significance within the DoIW. The Camballin Floodplain (Le Lievre Swamp System) is the closest DoIW system to the Development Envelope (~37 km from the western boundary of the Development Envelope). Three recognised surface waterbodies are present within or surrounding the Development Envelope:

- Fitzroy River, ~16 km south of the Development Envelope
- Mount Hardman Creek, crossing the Development Envelope (but the proposed disturbance footprint has been designed to avoid this creek)
- Mount Wynne Creek, north of the Development Envelope.

Figure 5-36 shows all the surface water features (in white) of the project area, Development Envelope and areas surrounding them.

Although not complex, the data provided in the subsections above (Section 5.3.1 – Section 5.4.3.5) have been used to inform the understanding of the hydrogeology of wetlands and waterways within the Development Envelope. Given the separation of Liveringa aquifer from the Grant/Poole due to the Noonkanbah shale, it is impacts to the Liveringa aquifer that is most likely to influence and affect surface water features. Groundwater in the Liveringa is recharged from local infiltration of rainfall where they outcrop, however infiltration is retarded by clay, shale and siltstone layers, both above and below the water table depending on the local stratigraphy.

The Mount Hardman Creek and ephemeral feeders are located within the physiographic region known as North Fitzroy plains (Lindsay & Commander, 2005). The North Fitzroy Plains consist principally of eolian sand and gravel, underlain by lateritised sandstone and mudstone of the Noonkanbah Formation and Liveringa Group (Lindsay & Commander, 2005). The ephemeral creeks are associated with small, internal drainage depressions consistent with others in the region (Lindsay & Commander, 2005). Eco Logical described these ephemeral waterways as occurring in sandy loams, clay or clay loams. The underlying formations are recharged mainly from rainfall on areas of outcrop, and locally from surface runoff and leakage through alluvium.

Mount Hardman Creek comprises limestone tableland and intricately dissected bevelled ridges; separated by plains and rocky karst surfaces with box valleys (BoM, 2021). The creek is non-perennial and only flows following large rainfall events. This indicates that, conceptually, groundwater influence is limited to maintaining areas of isolated surface water expressions until rainfall events result in the connection of these surface water expressions causing the creek to flow.

Claypans are likely prevalent throughout the Development Envelope. However, with the exception of Mount Hardman Creek, no known claypans or wetlands are located in or within close proximity of the Disturbance Footprint, which has been fixed to remove the uncertainty of impacts to surface sensitivities. As detailed in Section 5.4.5.1, modelling indicates the potential groundwater drawdown impacts are limited to 1 mm drawdown at 700 m from the abstraction point. As abstraction points will be located on the well sites themselves, the analysis considers impacts to surface waters within 700m of the well site disturbance footprint. The only identified surface water feature, or system with the potential to comprise a GDE, is Mount Hardman creek located ~1km away. Given the drawdown modelling provided in Appendix L has shown no impacts to Mount Hardman arising from the activity, no additional conceptual hydrogeological model has been completed.

Table 5-28 lists the distance of these features to the proposed well locations; they are shown in Figure 5-36.

Table 5-28: Surface waterbodies within the Fitzroy River Catchment

Well site name	Closest surface waterbody
Alfheim	~13.5 km southeast of Mount Hardman Creek
Jotunheim	~15 km south of Mount Hardman Creek ~26 km north of Fitzroy River
Midgard	~2.5 km southeast of Mount Hardman Creek
Muspelheim	~1 km southeast of Mount Hardman Creek
Nidavellir	~7 km southeast of Mount Wynne Creek ~10 km north of Mount Hardman Creek
Proposed well site 1	~10.7 km south-southeast of Mount Hardman Creek
Proposed well site 2	~18.7 km southeast of Mount Hardman Creek
Proposed well site 3	~25 km southeast of Mount Hardman Creek ~27 km north of Fitzroy River
Proposed well site 4	~24 km north of Fitzroy River
Vanaheim	~10 km south of Mount Hardman Creek

The Fitzroy River Catchment spans ~94,000 km^2, which is >20 per cent of the Kimberley region. The Fitzroy River generally flows between November and May following seasonal rainfall and has large but short duration floods (<two months in a wet year). Due to the long dry season, many of the tributaries of the surface fluvial system draining into the Fitzroy River are ephemeral streams or swale washes. The Fitzroy River contracts to pools with very low flows from about June to October (DoW, 2006). Ecologically, permanent pools are important refuges for aquatic species, enabling them to survive the harsh dry season.

Salinity levels in the Fitzroy River have not been routinely measured. However, some records are available from five stations from 1996 to 2005. Wet season salinity levels are usually of <250 mg/L TDS compared to dry season levels, which range up to 900 mg/L TDS (Vogwill, 2015). The river is fresh (<500 mg/L TDS) between Fitzroy Crossing and Noonkanbah, it is marginal (500–1,000 mg/L TDS) between Noonkanbah and Myroodah Station (~51 km west of the Development Envelope), and fresh from Myroodah to Willare (20 km south of Derby). Dry season river water salinity can be interpreted to reflect the salinity of the groundwater, because the contribution from surface run-off is negligible and the river flows are supported by baseflow. The brackish stretch of river at around the Yungngora Community may reflect the baseflow contribution both from the alluvial aquifer, and possibly from the Noonkanbah Formation, over which the river flows along that section. There may also be an influence of the Blina Shale upstream from Noonkanbah (Lindsay & Commander, 2005). The results from five historical sampling stations show that the salinity of river water often exceeds the desirable potable water limit of 500 mg/L during the dry season.

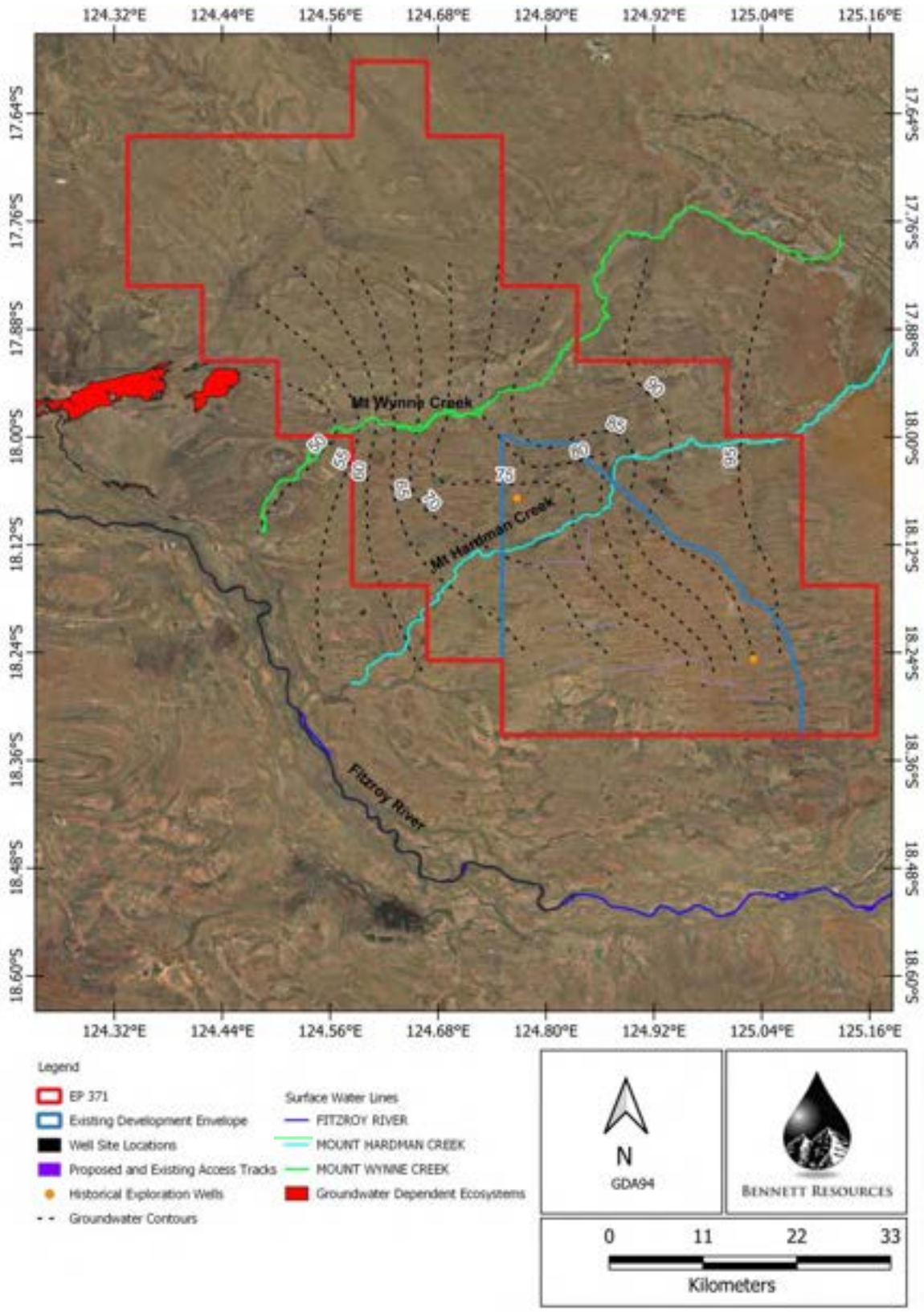

Figure 5-35: Water Bodies, Groundwater Contours, and Groundwater Dependent Ecosystems within the Development Envelope

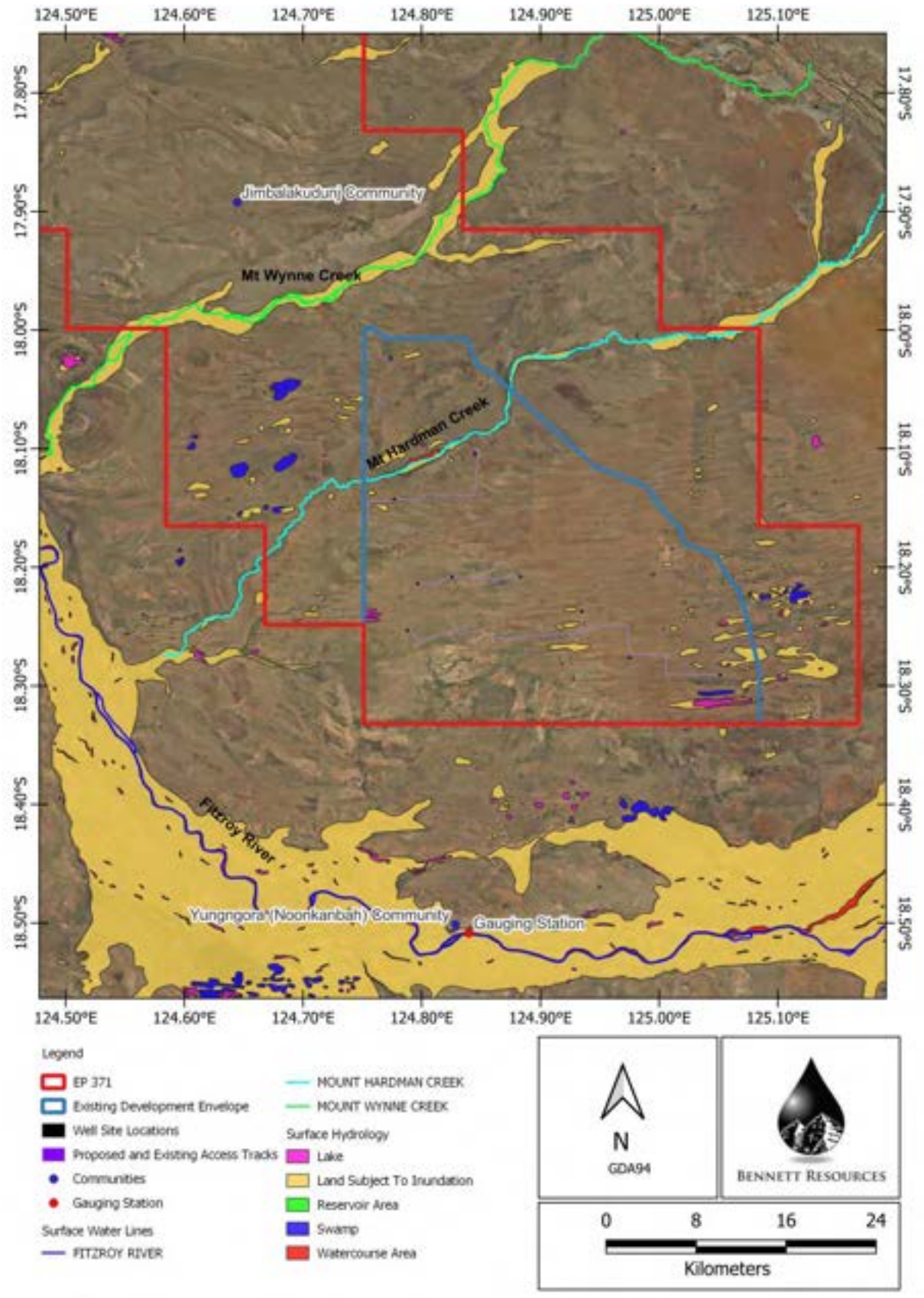

Figure 5-36: Surface waters within and surrounding the Development Envelope

5.4.3.7 Public drinking water source areas

PDWSAs are surface water catchments and groundwater areas that provide drinking water to cities, towns and communities throughout WA. PDWSAs are proclaimed under the WA *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*. The closest PDWSA to the project area are the:

- Camballin Water Reserve (~60 km west)
- Fitzroy Crossing Water Reserve (~51 km east of the Development Envelope).

The PDWSA for Camballin is supplied from groundwater within the Poole Sandstone (DoW, 2006). Table 5-29 lists the water quality (range and median values, all in mg/L unless otherwise stated) for these groundwater sources.

See Section 5.4.3.4.3 for the Fitzroy Crossing Water Reserve water quality information.

Table 5-29: Camballin groundwater quality (DoW, 2006)

Parameter	Bore 3		Bore 3/73		Bore 1/04
	Min–Max	Median	Min–Max	Median	
Salinity (total filterable solids by summation, less CO_2)	180–232	*200*	186–221	*202*	NT
Hardness ($CaCO_3$)	35–75.4	45	40–65.3	*42.5*	45[10]
Turbidity	ND–160	*0.8*	ND–60	*0.8*	0.4[10]
pH	6.43–8.4	*6.6*	6.42–8.4	*6.6*	6.5[10]
Aluminium (unfiltered)	ND–0.03	*ND*	ND–0.02	*ND*	ND[10]
Arsenic	ND–0.004	*ND*	ND–0.002	*ND*	NT
Barium	0.038–0.42	*0.1*	0.04–0.095	*0.095*	NT
Boron	ND–0.08	*0.063*	0.06–0.07	*0.06*	NT
Fluoride	0.2–0.3	*0.25*	0.2–0.35	*0.3*	NT
Iron (unfiltered)	ND–15	*0.55*	ND–5.5	*0.7*	0.183[10]
Manganese (unfiltered)	ND–0.16	*0.032*	ND–0.103	*0.03*	0.026[10]
Nitrate + Nitrite (as N)	ND–1.13	*ND*	ND–0.28	*ND*	0.011[10]

ND = Not detected; NT = Not tested

5.4.4 Potential impacts

5.4.4.1 Direct impacts

Direct impacts to inland waters from the Proposal's activities, while unlikely, may include:

- changes to groundwater levels (groundwater drawdown) associated with water extraction
- contamination of surficial aquifers due to lost circulation.

5.4.4.2 Indirect impacts

In addition to potential direct impacts to aquifers and formations arising from the Proposal, these indirect impacts to inland waters may arise:

- changes to surface water flow due to the construction of well sites and access tracks
- contamination of useable aquifers through unplanned fracture heights or well integrity failure (including casing failure)

[10] One test result only.

- contamination of surficial aquifers from an accidental release at the surface of drilling fluids, HFS chemicals, liquid hydrocarbons, or produced formation water
- potential risk to site activities and infrastructure due to extreme rainfall events
- impacts to subterranean fauna associated with groundwater drawdown or contamination.

5.4.5 Assessment of impacts

5.4.5.1 Changes to groundwater levels (groundwater drawdown) associated with water extraction

Groundwater is to be extracted from new extraction bores on each well site. Water extraction will be licensed, and the volume extracted will be within the allocated licence volumes, with a conservative maximum estimate of <100 ML to be used per Phase II well. BNR's water use for the Proposal per well represents a negligible portion (<0.034%) of the Canning Basin allocation limit and is far less than water extracted for other uses in the region such as by communities and pastoralists.

During the previous HFS program within EP 371, groundwater drawdown was monitored during water extraction activities (Buru Energy, 2012). Continuous depth loggers were installed in 2015 in two deep environmental monitoring bores at each well site, allowing the depth of the water table to be monitored over time. The depth loggers were installed at varying distances away from each water extraction bore, allowing any cone of depression formed during groundwater extraction to be readily detected. The occurrence and extent of any cone of depression depends on the volumes of water extracted from the extraction bore relative to the volumes available in the aquifer.

The monitoring program indicated that a short-term drawdown of 0.07 m and 0.08 m (Figure 5-37) was experienced at the two environmental monitoring bores (55 m and 27 m away, respectively, from the extraction bore). The data provided no evidence that a cone of depression occurred at either well site. Given that seasonal fluctuations of groundwater levels in the region are between 0.2 m and 1 m (Appendix I (Rockwater, 2016)), any short-term drawdown is expected to remain within the extent of natural variability, and therefore would be indistinguishable from normal seasonal fluctuations.

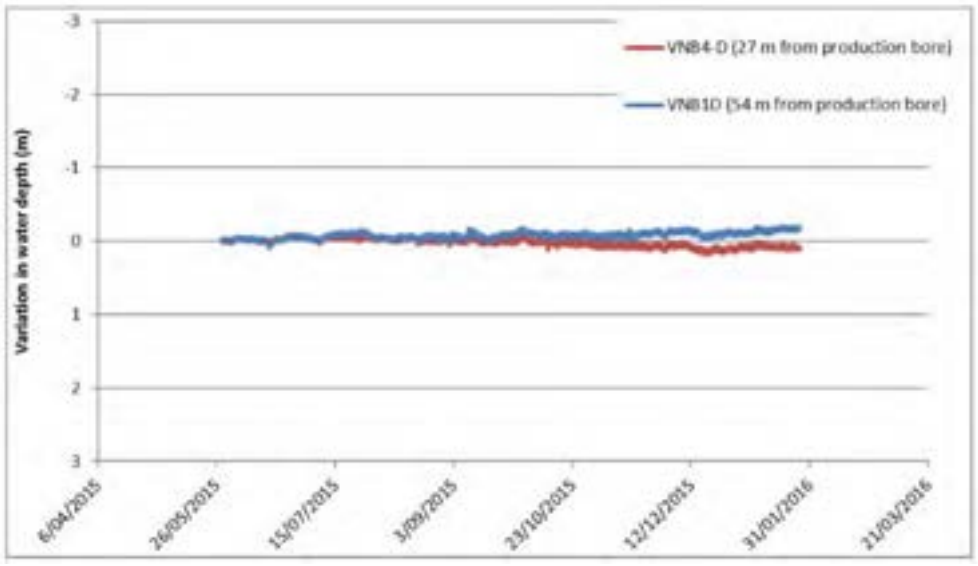

Figure 5-37: Variation in groundwater levels recorded at the Valhalla North 1 well site during the 2015 program

Results from site-based monitoring during the previous HFS program were used to develop a numerical model to determine the impact of groundwater extraction on the surrounding environment. This numerical model used the MODFLOW groundwater modelling software to understand drawdown impacts for considerably larger volumes of water extraction. Using an extraction volume of 100,000 kL (100 ML) (which is the conservative maximum extraction for a Phase II well), the model predicted that a short-term drawdown of 1 m or more could extend up to 780 m from the extraction water bore at the (deep) level of the screens in the extraction bore (Appendix IRockwater, 2016)).

The model predicted that even with pumping for the maximum volume of 100 ML, groundwater levels would be expected to recover rapidly to within 0.2 m of baseline levels within hours of stopping extraction and to fully recover within weeks. Consequently, extracting larger volumes than those required for the Proposal is expected to result in temporary drawdown that is within natural variability.

Discussions with DWER identified the need for additional modelling, therefore, additional modelling was commissioned from Intera Geosciences Pty Ltd. MODFLOW 2005 was selected as the appropriate software as it simulates steady and nonsteady flow in an irregularly shaped flow system in which aquifer layers can be confined, unconfined, or a combination of confined and unconfined. Two primary models were developed, one simulating the unconfined Liveringa aquifer (Mod 1) and one simulating the confined Grant/Poole Group system (Mod 2). A full explanation of the modelling approach is contained in Appendix L.

Model results are presented as mapped drawdown contours with a minimum contour of 0.2 metres and a 0.2 metre contour interval. This contour interval was selected as normal seasonal fluctuations are known to range between 0.2 metres and one metre, so values less than 0.2 metres are not likely to constitute significant impacts relative to natural variations (Intera Geosciences Pty Ltd, 2023). To ensure a conservative approach to modelling was undertaken, BNR utilised a pumping duration of six months which is much longer than would be anticipated for any abstraction bore and assumed that each wellsite was producing water for the same 6-month period, which is not realistic as only one or two abstraction bores are expected to be producing at any one point in time. The modelled drawdown at the end of the six-month pumping period for Mod 1 (the Liveringa Aquifer) showed potential for a 0.2 m drawdown within 400 metres of each pumping bore assuming that all 10 well sites were abstracting water at the same time (Intera Geosciences Pty Ltd, 2023). However, given this model provides an unrealistic representation of groundwater drawdown as all well sites will not be pumping at the same time, and given the proximity of the Muspelheim wellsite to Mount Hardman Creek (1 km), additional predictive modelling for Mod 1 was performed with pumping only applied to the Muspelheim wellsite to provide an informed and realistic indication of potential drawdown exposure to the GDE. Modelling indicates that for a single wellsite a 10cm drawdown is expected 400 m from the pumping bore reducing to 2 cm at 500 m and 1 mm drawdown at 700 m (Intera Geosciences Pty Ltd, 2023).

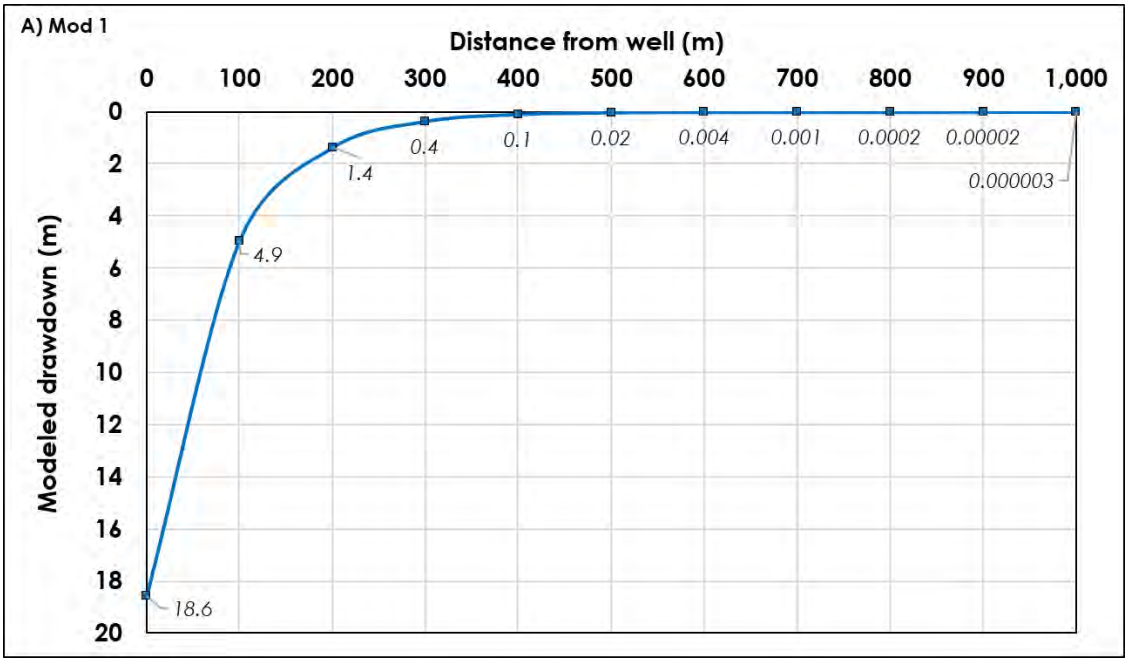

Figure 5-38: Liveringa Drawdown from Muspelheim (Intera Geosciences Pty Ltd, 2023)

Based upon modelling predictions from Intera Geosciences (2023), BNR does not believe that the potential drawdown associated with the Proposal pose a significant impact to the Mount Hardman Creek GDE or existing pastoral bores.

5.4.5.2 Potential contamination of surficial formations due to lost circulation or well integrity issues, including casing failure

During all drilling activities, the most sensitive well sections are the surface hole sections because they penetrate through surficial aquifers that generally have low salinities and thus are most suited for other uses (such as potable water or agricultural uses). Therefore, the loss of drilling fluid circulation (i.e. drilling fluids are released to subsurface formation) is the largest risk to surficial formation drilling activities. The risk of soil and groundwater contamination from these activities is well understood because onshore exploration and appraisal drilling is undertaken regularly throughout WA and the world. Consequently, there is a standard suite of management measures that will be implemented, including:

- drilling fluid systems for the surface hole sections comprise low-toxicity mud systems
- install and cement a surface casing across the useable aquifers to isolate them from deeper formations and aquifers (DMPR, 2002).

As detailed in Figure 2-1, the surface hole sections are likely to be installed to 550 m, well below the Liveringa Formation. This will ensure that sufficient isolation exists before drilling the next hole section.

BNR will also ensure that there are always two barriers between the well and any useable aquifers, which is standard (and required) practice.

Rockwater (2016) was engaged to predict duration of groundwater migration to key sensitivities based on hydraulic conductivity, hydraulic gradients and specific yields. The study (Appendix I) concluded that groundwater would take ~16,000 years to move ~32 km. Based on the unlikely event that a lost circulation occurs when drilling the top-hole sections, resulting in drilling fluids being released to groundwater, it is extremely unlikely that due to the migration timeframe and the nature of the low-toxicity mud system used that any change to groundwater quality would be observed, noting that the closest groundwater user is at least 18 km from the project area.

5.4.5.3 Changes to surface water flow due to the construction of well sites and access tracks

Given the location of the disturbance footprint, significant surface water flows will not need to be diverted. In fact, since referring the Proposal, BNR has amended the disturbance footprint to ensure it is located away from the non-perennial Mount Hardman Creek, and away from any low-lying marshlands and areas that are subject to flooding.

However, seasonal rainfall that causes short-duration flooding events occur regularly in the Kimberley between November and May. Therefore, all hardstands (roads and well sites) need to be constructed with sufficient elevation to mitigate flooding impacts. At a regional scale, the total disturbance footprint for the Proposal is 112 ha. The Fitzroy River Catchment spans ~94,000 km^2—assuming that the disturbance footprint would result in 100 per cent run-off loss, disturbance associated with this Proposal is ~0.001% of the total natural catchment. Consequently, changes to surface water flow will not result in impacts to the regional catchment.

Locally, there may be minor changes to surface water flow, limited to flow of rainwater during the wet season. However, each well site is only ~200 m × 200 m, so the extent to which changes to surface rainwater flows will occur is limited. Each well site is subject to appropriate drainage design, with run-off diverted to sediment basins (or similar) to minimise erosion. Access roads will be constructed with a camber, table drains, culverts (as required) and regular turnouts to discharge the water into the natural surrounds.

With the proposed mitigations in place, changes to surface water flow is not expected to result in regional impacts, and any localised impacts are not expected to be significant.

5.4.5.4 Potential contamination of aquifers through unplanned fracture heights

International peer-reviewed studies have found that hydraulic fracturing in shale and tight gas formations affects a very limited portion of the entire thickness of the overlying bedrock and is unable to create direct hydraulic communication between target zones and shallow aquifers through induced fractures (Fisher & Warpinski, 2012; Davies, Mathias, Moss, Hustoft, & Newport, 2012). The review by Davies et al. (2012) was based on analysing the data acquired from several thousand shale gas HFS in the United States (US). This data reported a maximum vertical fracture length of 588 m (Davies, Mathias, Moss, Hustoft, & Newport, 2012).

The comparison of nearly 4,000 tops of micro seismic fractures to the maximum groundwater depths across four major US shale formations showed that in no cases did the fracture zones reach overlying aquifers. A separation of over 800 m remained between the local aquifers (Fisher & Warpinski, 2012), with only one per cent of these fractures being >350 m high (Davies, Mathias, Moss, Hustoft, & Newport, 2012). A further study by Davies et al. (2012) in the United Kingdom found that hydraulic fractures remain well confined to the target interval, even in the presence of faults.

As it relates to faults and fault seal for this Proposal, all significant faults in the development area are downthrown to the west and formation juxtaposition would place the proposed Laurel and Anderson unconventional reservoirs against Laurel or older units updip. Given the current data, there is unlikely to be any significant juxtaposition against younger (Grant or Poole) units updip. In addition, conventional hydraulic fracture stimulations are not considered long-term deformations. Once pumping stops, within minutes fractures close. Further, after a stimulation, the well is flowed back, and the local stimulated rock volume is depressurized as the load water is produced. There is no expectation of high pressures to remain above the local geopressured gradient beyond the time during which the wells are undergoing their stimulation.

With regard to stress Orientation, all faults are closed and pose no geomechanical hazard for upward propagation of fracturing fluids or hydrocarbons into the recognized aquifers as the activation energy required to dilate faults or fractures in tension is higher than overburden, which means the fracture growth would rotate to horizontal before opening such faults in tension (Appendix B).

The unconventional resources within the Laurel have permeabilities between 10nd to .17md and are predominately self-sealing without HFS. Historical HFS activities for the Asgard and Valhalla wells exhibited total stress heights of between 400-600m but exhibited more downward growth development than upward. While there are faults in the section, geomechanical data supports that the faults will not open from HFS. The shallowest aquifers that are currently used for drinking are less than 1,000m in depth and any stimulation zones here will be initiated at over 2,600m and more likely over 3,200m in depth providing a rock thickness of 1,600m – 2,200m between an injection point and any potential drinking water aquifer.

In summary, well analysis of the stratigraphy (rock layering) (Table 5-20) indicates that within EP 371:

- the top of the Laurel Formation zones of interest for HFS treatment is >2,400 m deep
- there is ~1,800 m separation between the targeted Laurel Formation and the surface Liveringa Aquifer, of which ~1,100 m is impermeable hard rock
- located directly above the Laurel Formation, the Anderson Formation has a shale layer that acts as a confining geological seal for hydrocarbon migration and therefore would act as an immediate thick containment barrier of impermeable hard rock to unplanned vertical growth of fractures.

The proposed vertical extent of the fracture envelope is expected to be ~150 m. It is deemed not plausible, physically, for induced fractures to create a hydraulic connection between the deep back shales and other tight formations and overlying potable aquifers such as the Grant and Poole Sandstone aquifers. This is determined based upon limitations to fracture height growth and potential fault slip, as discussed in the HFS Scientific Inquiry (Independent Scientific Panel Inquiry, 2018). Because there is ~1,800 m separation between the targeted Laurel Formation and the surface Liveringa Aquifer, at least 600 m separation between the Laurel Formation and the Grant/Poole Sandstone aquifers, and the predicted vertical extent of fractures for the activities is 150 m, the risk to aquifers is extremely low.

Based on available seismic data and previous reviews of the area, the potential for geomechanical hazards in the Development Envelope is considered low. This will be verified with the most up to date seismic information, followed by ongoing assessment as wells are constructed. Consequently, based on the available scientific information, and given the significant separation between the targeted Laurel Formation and the Liveringa Aquifer, BNR does not believe that contamination of useable aquifers through unplanned fracture heights is a credible risk for the Proposal.

5.4.5.5 Potential contamination of surficial aquifers from an accidental release at the surface of drilling fluids, HFS chemicals, liquid hydrocarbons, or produced formation water

A spill from one of the water retention ponds used to store formation water produced during well testing, drilling fluids, or a spill from a chemical or chemical additive (unmixed) to the ground will result in a varying level of exposure, depending on the volume of release. BNR plans to install multiple liners for the produced water pond and mud sump, thus the most credible scenario is a small leak from a pond versus a catastrophic

failure of both liners. Consequently, the volume of any accidental release from these ponds would be small. In addition, these ponds will have a leak detection system that will monitor the integrity of the top liner.

As described in Table 5-28, water from the Laurel Formation that was produced during well testing ('produced formation water') was characterised by the previous operator of EP 371. The previous operator took multiple water samples and had them analysed at a NATA-accredited laboratory (Buru Energy, 2018); Table 5-30 lists these results. In summary, produced formation water from the water retention ponds is very high in salt at three to five times the salt concentration of sea water, not toxic to fauna or humans and has very low levels of heavy metals. In addition, although naturally occurring radioactive material (NORM) was detected, the concentrations were well below the exposure concentrations identified by the Australian and New Zealand guidelines for fresh and marine water quality (ANZECC and ARMCANZ, 2018) and the Australian Drinking Water Guidelines (NHMRC and NRMMC, 2011 (updated March 2021)). Given the characterisation of the produced formation water, a release is not expected to result in a significant change to soil or water quality that could not be managed with standard industry controls. Section 5.8.3 contains further information about NORMs.

Table 5-30: Produced formation water – Laurel Formation characterisation

Analyte	Unit	Date	October 2015	October 2015
		Onsite management levels	Asgard 1 pond post-well test	Valhalla North 1 pond post-well test
Arsenic	mg/L	0.5 [11]	<0.02	<0.02
Barium	mg/L	2 [12]	20	12
Boron	mg/L	4 [12]	9.4	14
Cadmium	mg/L	0.002 [12]	<0.002	<0.002
Chloride	mg/L	30,000	16,000	17,000
Chromium VI	mg/L	0.05 [12]	<0.02	<0.02
Copper	mg/L	1 [11]	<0.02	<0.02
Lead	mg/L	0.1 [11]	<0.02	<0.02
Manganese	mg/L	0.5 [12]	0.15	0.51
Mercury	mg/L	0.002 [11]	<0.0001	<0.0001
Nickel	mg/L	1 [11]	<0.02	<0.02
Selenium	mg/L	0.01 [12]	<0.02	<0.02
Zinc	mg/L	20 [11]	<0.1	<0.1

Because surface spill events are well understood, a standard suite of preventive and management measures (including spill response and recovery arrangements) will ensure that, should a spill occur, impacts to groundwater quality (if any) would be negligible.

If standard management measures are implemented, BNR does not expect these events to occur, but if they do, any indirect impacts are not expected to cause a significant environmental impact.

5.4.5.6 Potential risk to site activities and infrastructure due to extreme rainfall events

To understand potential risk to site activities and infrastructure arising from extreme rainfall events, BNR completed a desktop flood risk assessment. Data were obtained through the Department of Water and Environmental Regulation's Water Information Reporting (WIR) website to understand streamflow variation and flood height. Site 802006, located on the Fitzroy River at Noonkanbah (Lat -18.50842693, Long 124.8397398), was the closest gauging station to the Development Envelope (Figure 5-36) and subsequently was considered the most appropriate data source for completing this assessment. This station has been collecting stream gauging data since 26 October 1997 and is located 51.07m AHD.

[11] Stock water: Australian and New Zealand guidelines for fresh and marine water quality (ANZECC and ARMCANZ, 2018).
[12] Health values: Australian Drinking Water Guidelines 6, Version 3.5 (NHMRC and NRMMC, 2011 (updated March 2021)).

In January 2023, the Kimberley experienced a one in 100-year flood event. According to news reports, the Fitzroy River reached a “record” height of 15.8 metres on 4 January 2023. Reviewing the data gathered by DWER from Site 802006, a max gauged state of 18.223 was recorded which subsequently is the figure that will be used for further analysis.

Floods in the Fitzroy tend to disperse either side into the floodplains. Although not exact, for the purpose of this assessment, it is assumed that flooding is regular across the landscape, so that any area less than 69.29 AHD (51.07 + 18.22) would be subject to flooding. The 10 proposed well sites are shown in Figure 5-36 and Table 5-31 including the approximate elevation of each site.

Table 5-31: Well site locations and their approximate elevation

Well	Latitude	Longitude	Approximate elevation
Alfheim	−18.207772	124.882912	112m
Jotunheim	−18.253224	124.787923	73m
Midgard	−18.14258	124.776958	128m
Muspelheim	−18.103833	124.844723	137m
Nidavellir	−18.023477	124.773575	125m
Proposed Well 1	−18.208448	124.825451	110m
Proposed Well 2	−18.237182	124.934808	77m
Proposed Well 3	−18.276184	124.974959	73m
Proposed Well 4	−18.290737	125.051452	73m
Vanaheim	−18.213578	124.796585	87m

As can be seen from Table 5-31, all of the sites are situated at a higher elevation than the assumed flood level of 70 metres. Noting that Noonkanbah Community is located at 70 metre elevation and given that anecdotal evidence indicates that the community, while cut off due to road closures, was not significantly affected by floodwaters in January, the assessment above is considered suitable for informing the level of risk for the Proposal.

In addition to flood events, BNR considered the risk of an extreme rainfall event causing onsite ponds to overflow. To inform the assessment BNR reviewed rainfall statistics from Fitzroy crossing which has been collected for the period between 1997 and 2023. The annual average rainfall rates for Fitzroy Crossing over this period is 682 mm (BoM, 2023). Using the BoM Rainfall IFD data system (BoM, 2023a), a rainfall intensity chart has been created for Fitzroy Crossing (Figure 5-37). BoM (2023a) indicates that the average number of days during the wet season where rainfall of >= to 100 mm is recorded is three days. Thus, using IFD data for a one in 100-year event (with a duration of three days) the volume of rain was estimated to be 345 mm (based upon rainfall intensity of 4.80 mm/hr).

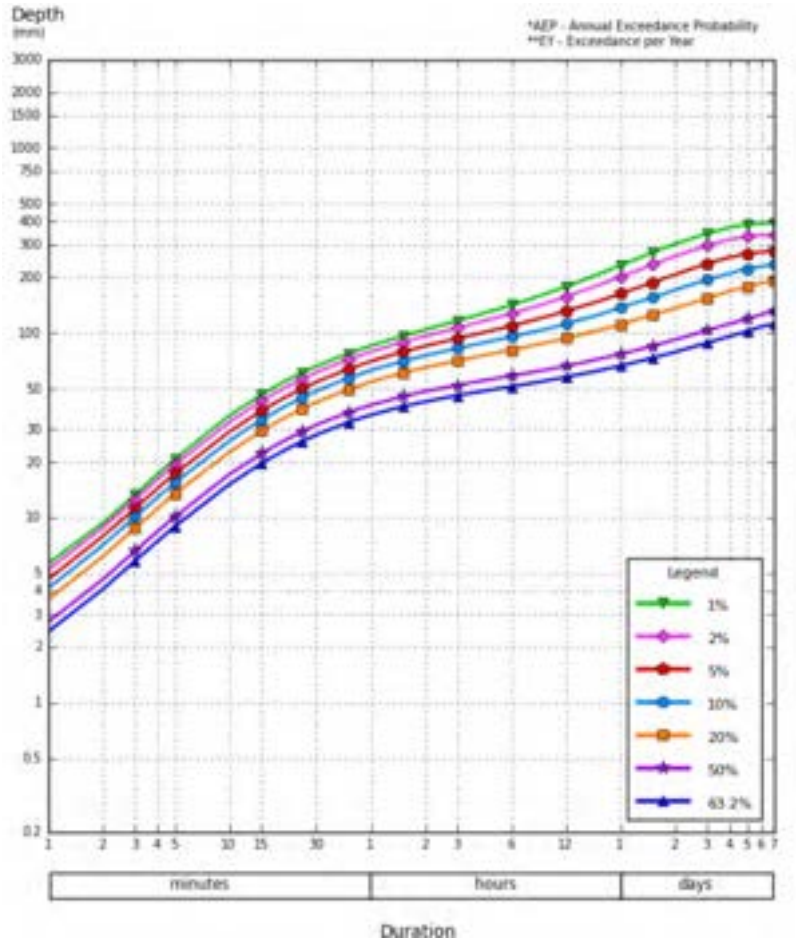

Figure 5-39: Rainfall Intensity Chart – Fitzroy Crossing

While the size of the mud sump and water retention pond have not yet been designed, they are anticipated to have volumes in the order of 5000 m^3 and 114,400 m^3 respectively. Based upon the calculations detailed in Table 5-32, BNR has demonstrated that the volume of ponds sufficiently caters for one in 100-year rainfall events and a 90th percentile wet season.

Table 5-32 Sump and pond calculations

Type	Sump
Drilling fluid[13]	1,750 m^3
Drill cuttings (well site)[14]	900 m^3
Freeboard (500mm)	600 m^3
Rainfall contingency (not considering evaporation offset)	
90 percentile wet season (682 mm)	819 m^3
1in 100-year storm event (345 mm in 3 days)	414 m^3
Total	4483 m^3
Volume (20m x 60 m x 4m)	5000 m^3

Type	Water retention pond
HFS water	78,242 m^3
Freeboard (500 mm)	10,400 m^3
Rainfall contingency (not considering evaporation offset)	
90 percentile wet season (682 mm)	14,186 m^3
1in 100-year storm event (345 mm in 3 days)	7176 m^3
Total	110,004 m^3
Volume (L-shaped pit: 200m x 96m x 5.5m +80m x 20m x 5.5m	114,400 m^3
Maximum produced water:	(Water pond)
Produced water (90 day well test, max[15])	54,769m^3
Freeboard (500mm)	10,400m^3
Rainfall contingency (not considering evaporation offset)	
90 percentile wet season (682mm)	14,186m^3
1 in 100-year storm event (345mm in 3 days)	7,176m^3
Total	**86,531m^3**
Volume (L-shaped pit: 200m x 96m x 5.5m +80m x 20m x 5.5m)	114,400m^3

5.4.6 Mitigation

Table 5-33 summarises the mitigation measures and their hierarchy These will be included in an EP for assessment and acceptance by DEMIRS under the PGER(E)R before activities commence.

In addition, a Part IV Groundwater Management Plan (GWMP) (Appendix M) has been prepared to support this ERD. The GWMP describes the proposed groundwater monitoring program as well as trigger and threshold criteria that will be implemented to minimise impacts associated with the Proposal. The GWMP will be implemented to demonstrate that residual impacts are not greater than predicted.

[13] This assumes no evaporation occurs between the first and second well on the wellsite and two wells worth of drilling fluid are stored in the pit after drilling is finished on the second well.

[14] This assumes the deepest/longest wellbore is drilled and covers two wells worth of cuttings.

[15] This assumes 70% of the HFS load is recovered during the 90-day well test. This is considered highly unlikely and 10-35% load recovery is expected.

Table 5-33: Proposed mitigation measures – inland waters

Mitigation hierarchy	Mitigation measure	Further information
Avoid	Geomechanical risks assessment	In accordance with ESD Item 12, a comprehensive geotechnical risk analysis has been conducted and is attached in Appendix B. Further geotechnical risk assessment will be completed after each well has been constructed and prior to any HFS taking place. The site-specific geotechnical risk assessment will also utilise information gathered during the installation of the groundwater monitoring bores.
Avoid	Early warning system for detecting geomechanical events	In accordance with ESD Item 13, an early warning system for detecting geomechanical events has been developed and will be implemented for the Proposal. The detection system is described in Appendix B. and includes monitoring for one-month pre and post any HFS activities.
Avoid	HFS not located within 2,000 m of a PDWSA	The wells are not located within 2,000 m of a PDWSA (Section 5.4.3.7).
Avoid	HFS treatment will have more than 600 m vertical separation to the nearest useable aquifer.	As is good industry practice (in the absence of a state Code of Practice), BNR will ensure that HFS will not occur in formations that have <600 m vertical separation to the nearest useable aquifer. This will be checked and confirmed once each well has been constructed, along with a geotechnical risk analysis.
Avoid	Surface casing cemented across all useable freshwater aquifers	In accordance with the Guidelines for the protection of surface and groundwater resources during exploration and appraisal drilling (DMPR, 2002), the potential for contaminating groundwater resources will be managed by installing casing that is secured and sealed by a sealing material such as cement.
Avoid	Well Management Plan	In accordance with ESD Item 14 and Regulation 10 of the PGER (Resource Management and Administration) Regulations 2015, every new well is required to have a WMP in place to ensure the well is designed and managed in accordance with sound engineering principles and industry good practice, including identification of risks. The WMP specifically describes and addresses well integrity risks and includes the requirements for the operator to manage these accordingly. Specifically, the WMP will address casing integrity management that will then be assessed and accepted by DEMIRS before HFS commences. Therefore, well management plans will be developed and approved prior to each well being constructed. A summary of well integrity management is provided in Section 1.4.3.2.
Avoid	Well integrity assessment	In accordance with ESD Item 14, to further ensure well integrity and thus environmental protection and public safety, well design, construction, and testing will be assessed by an independent / certified expert well examiner approved by DEMIRS. A summary of assessment is provided in Section 1.4.3.2.
Avoid/Minimise	Part IV Groundwater Management Plan	As required by the ESD Item 4, BNR has developed a GWMP (Appendix M) that documents the groundwater monitoring requirements along with management actions associated with trigger and threshold criteria that must be implemented. BNR believes that with the triggers detailed in the GWMP, groundwater sensitivities (such as subterranean fauna) will be protected. BNR will ensure the location of all monitoring bores is completed in consultation with DWER and DEMIRS. BNR will complete all groundwater monitoring (including local baseline sampling) in accordance with the Part IV Groundwater Management Plan.
Minimise	Produced formation water storage pond design	As per WQPN 26 (DoW, 2013), all lined storage compounds will have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowing for any evaporative water loss and the effects of any water re-use recovery system. All water storage ponds will be designed to meet these requirements.
Minimise	Groundwater monitoring bore installation	Installation and drilling of all water bores (including abstraction bores) will be hydro stratigraphically logged in detail and geophysical interpretation of

Mitigation hierarchy	Mitigation measure	Further information
		groundwater quality collected, for the interval where fresh aquifers are known to be present (including through the Grant formation). Annulus seals and gravel packs will be used, where necessary, to isolate the zone being monitored and prevent potential cross contamination via the bore casing as required by the Minimum Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee, 2011) required to be followed as detailed in the Groundwater monitoring in the onshore petroleum and geothermal industry guideline (DMP & DoW, 2016). BNR will conduct validation water samples (along with QA/QC samples of any fluids or water used for the bore installation process) at a point of discharge from the circulation system to understand if cross contamination may be occurring as evidenced by fluid constituent presence associated with bore installation. This may involve the use of tracer dyes, but these specifics are subject to local conditions, aquifer depths and will be directed by a hydrogeologist during bore installation.
Minimise	Petroleum well installation	BNR will hydrostratigraphically log the petroleum well during drilling activities and collect a geophysical interpretation of groundwater aquifers.
Minimise	Pond design	In accordance with WQPN 26 (DoW, 2013), surface ponds used for short-term containment of wastewater or solids that may leach contaminants, require synthetic membranes and need to meet specific requirements, including: • all fluid containment liners should have a coefficient of permeability of less than 2×10^{10} m/s • a minimum thickness of 0.75 mm • dual liners • leak detection All surface ponds will be constructed to meet these requirements.
Minimise	Chemical inventory	In accordance with ESD Items 5, 6, 7, 8, and 9, a chemical inventory has been developed for the Proposal (Appendix A).
Minimise	Low-toxicity mud system	BNR plans to use a low-toxicity mud system for the top-hole section that, if lost to the environment, is not expected to result in environmental impacts.
Minimise	Fugitive discharges are monitored and reported	As per Regulation 15 of the PGER(E)R 2012, BNR will monitor, and record volumes of fluids not recovered during circulation.
Minimise	Groundwater licences for extraction bores	In accordance with the RIWI Act, all water extraction must be licensed prior to take because the Development Envelope is located within a proclaimed groundwater area (DoW, 2010). BNR will ensure all groundwater licences are in place and kept up to date.
Minimise	Meter calibration and monitoring for extraction bores	As described in the Measuring the taking of water guidelines (DoW, 2016), Clause 46 of Schedule 1 of the RIWI Act state that licensees may be subject to metering, which is recognised as an accurate and reliable measuring technique. This is further expressed in the RIWI Regulations 2020, which now require water licences with annual water entitlements of between 10 – 50ML per year to install meters. Meters will be installed as required.
Monitor	Site water audit	As required by ESD Item 4, all water wastes and emissions, including formation water produced during well testing, resulting from the Proposal will be recorded and monitored. A site water audit on completion of HFS at each well site will be undertaken, accounting for water produced, evaporated and disposed, to detect significant leakage of fluids and determine whether remedial action to track any contaminants is warranted.
Monitor	Ecotoxicology testing on produced formation water	As required by ESD Item 4, Ecotoxicology testing of produced formation waters at each wellsite will be conducted by an independent NATA endorsed laboratory, either through the sea urchin fertilization test using Heliocidaris tuberculate or other appropriate methodology. Reporting will be done in accordance with annual compliance reporting to DMAs.

5.4.7 Environmental outcomes

Throughout the planning phase, BNR has reviewed studies undertaken by the previous operator of EP 371 and analysed geological records to understand the potential impacts associated with the Proposal. Based on this information, the outcomes of the Proposal are predicted to be:

- no impacts to hydrological regimes or groundwater quality, demonstrated by:
  - no significant drawdown of the aquifer following completion of the Proposal that is considered outside seasonal fluctuations
  - no change to groundwater quality attributable to the Proposal.

Based on these predicted outcomes and the evidence shown throughout this ERD, BNR does not believe that the Proposal will result in a significant impact to inland waters. The environmental mitigation measures intended to manage and minimise impacts to inland waters are considered effective. Consequently, BNR believes that the EPA's objective to:

> *'maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected'*

can be met.

BNR has considered the WA Environmental Offsets Policy (Government of Western Australian, 2011) and Guidelines (Government of Western Australia, 2014), and has used the Residual Impact Significance Model (Figure 3 in WA Environmental Offsets Guidelines) to determine if any residual impacts are significant and if these may require an offset. Using this process, BNR determined that all residual impacts to inland waters are not significant, and therefore BNR does not believe actions are required to offset the predicted outcomes of the Proposal. The assessment outcomes are presented in Section 5.11.

A self-assessment of impacts on matters of NES in relation to inland waters and regional wetlands was also undertaken against the Commonwealth's significant impact guidelines for matters of NES (Department of the Environment, 2013). The Proposal's activities were determined not to have any impacts on any wetlands of international importance. Consultation with DAWE in June 2020 and October 2021 and the provision of BNR's self-assessment's outcomes to DAWE further confirmed that no significant impacts to any matters of NES were expected. Initial advice from the Commonwealth had been that this project was not required to be referred. BNR has continued to engage with DCCEEW to reiterate that the environmental impacts associated with the Proposal do not result in any direct or indirect mechanisms that would cause a significant impact to matters of NES protected under the EPBC Act.

5.5 Social surroundings

5.5.1 EPA objective

To protect social surroundings from significant harm.

5.5.2 Legislation, policy, and guidance

- Environmental Factor Guideline Social Surroundings (EPA, 2016j)
- Technical Guidance: Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage (EPA, 2023)
- Environmental Protection (Noise) Regulations 1997 (Noise Regulations)
- Petroleum and Geothermal Energy Resources (Environment) Regulations 2012
- *Native Title Act 1993* (Commonwealth)
- *Aboriginal Heritage Act 1972* (WA).

While the bulk of the ERD was prepared in 2021, BNR has noted developments with the Aboriginal Heritage Act (including the enactment and subsequent repeal of the *Aboriginal Cultural Heritage Act* 2021) to ensure consistency with the Proposal and this environmental factor. On 15 November 2023 the Aboriginal Cultural

Heritage Act 2021 (WA) was repealed, meaning that the previous Aboriginal Heritage Act 1972 (WA) was restored, with amendments.

5.5.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing and procedure of the environmental review, required by Section 40(3) of the EP Act. Table 5-34 lists the ESD requirements specific to social surroundings.

Table 5-34: ESD checklist – social surroundings

Social surroundings		
Required work		**BNR response**
42	Characterise the surrounding land use and amenity values in, and adjacent to the Proposal Area with a focus on the sensitive receptors and important areas for human use that could be affected by noise and dust emissions, traffic, and amenity issues. Include relevant maps to show the locations of the sensitive receptors likely to be affected by the Proposal.	Section 5.5.3
43	Provide a collation of baseline information and processes to ensure the documentation and systematic monitoring of matters relating to amenity and aesthetics.	Section 5.5.3.3 Section 5.5.6
44	Undertake a site-specific noise assessment in accordance with EPA and contemporary guidance. Demonstrate that noise can be managed such that it complies the Environmental Protection (Noise) Regulations 1997 at sensitive receptor locations.	Section 5.5.5.2 Appendix P
45	Undertake and provide baseline site-specific noise level data.	Section 5.5.3.8 Appendix O
46	Provide predictive modelling of noise emissions and impacts.	Section 5.5.5.2 Appendix P
47	Provide ongoing monitoring and management covering the entire lifecycle of the Proposal.	Section 5.5.6
48	Include an assessment of the cumulative impact of noise from hydraulic fracture stimulation and associated activities, on places within proximity to people and domestic animals and provide management options to minimise noise.	Section 5.5.5.2 Section 7.4
49	Identify the types and sizes of trucks, the road upgrades required to accommodate operations and ensure the safety of other road users. Describe how BNR will engage with local government to ensure public roads are maintained to provide for the ongoing safety of road users.	Section 5.5.5.4 Section 5.5.6
50	Provide baseline road-use statistics measuring volumes of vehicle movement and type and provide details of monitoring of road use, throughout the lifecycle of the Proposal.	Section 5.5.3.9
51	Reduce emissions from traffic by ensuring the regular maintenance of all vehicles.	Section 5.5.6
52	Provide a peer-reviewed, site-specific human health risk assessment, addressing potential short and long-term health impacts of the Proposal that addresses health risks from: • airborne chemicals • chemicals proposed to be used in drilling and hydraulic fracture stimulation • fluids and those expected to be present in produced or flowback water • storage and handling of drilling and hydraulic fracture fluids • storage and disposal of drilling and hydraulic fracturing flowback fluids (including wastewater). Note: peer-reviewed, site-specific human health risk assessments will be provided to the Department of Health for comment.	N/A refer to Section 3.4
53	Undertake a comprehensive local social impact analysis prior to commencement of activities, to understand and measure the social dimensions of change and its links to mental health and wellbeing, due to impacts from changes to the physical or biological surroundings.	Section 5.5.5.8
54	Determine impacts to human health in relation to worker accommodation (particularly dust, water supply, wastewater disposal etc.) by using the Department of Health scoping tool.	N/A refer to Section 5.5.5 introduction
55	Undertake and provide baseline dust monitoring [minimum 12 months] prior to regulated activities.	Section 5.5.3.7
56	Identify cumulative impacts from dust on local and regional ecosystems and public health.	Section 5.1.5.4 Section 5.5.5.1

Social surroundings		
Required work		**BNR response**
57	Propose measures to minimise the generation of dust throughout all operations when compared to baseline monitoring.	Section 5.5.6
58	Characterise and describe the social, cultural and heritage values within the Proposal area and any sensitive receptors that may be directly or indirectly impacted as a result of this Proposal. Identify sites of social significance within a regional context, in consultation with the Traditional Owners.	Section 5.5.3.1 Section 5.5.3.2 Section 5.5.3.5 Section 5.5.3.6
59	Conduct investigations, including ethnographic, ethnobotanic, and archaeological surveys in consultation with the Traditional Owners, to determine the significance of potential impacts (direct, indirect and cumulative) to social surroundings as a result of this Proposal.	Section 5.5.3.5.2
60	Proposals likely to impact on Aboriginal heritage or significant sites must include an Aboriginal Heritage Management Plan developed in consultation with the Traditional Owners and the Department of Planning, Lands and Heritage. The Aboriginal Heritage Management Plan must: • include input from Traditional Owners whose land is under consideration for petroleum development • detail the role of the Traditional Owners in monitoring the condition and protection of their cultural heritage and significant sites • be reviewed and deemed acceptable by the Department of Planning, Lands and Heritage.	N/A no management plan required, refer to Section 5.5.3.5.2
61	Detail how cultural orientations will be made available to the Proposal employees and contractors to raise cultural awareness, including issues specific to Aboriginal heritage, and be undertaken by local Traditional Owner groups or their approved cultural awareness providers.	Section 5.5.6
62	Describe and assess the potential impacts (direct, indirect and cumulative) to social surroundings as a result of changes to the environment from the Proposal giving consideration to Traditional Owners and Pastoral Stations and their activities on the land.	Section 5.5.5
63	Apply the mitigation hierarchy and discuss proposed objectives/outcomes, monitoring, management and mitigation measures including decommissioning and rehabilitation outcomes to be implemented to appropriately avoid and minimise impacts to social surroundings.	Section 5.6.6
64	Demonstrate and document how the EPA's objective for this factor can be met.	Section 5.5.7

5.5.3 Receiving environment

5.5.3.1 Social context

The Kimberley region has a sparsely distributed population of ~40,000 people across a region twice the size of the state of Victoria. The regions has six towns, ~160 Aboriginal communities, and numerous pastoral homesteads—Broome is the largest town (population ~16,000 (ABS, 2016)), followed by Kununurra (population ~5,300 (ABS, 2016)).

There are two main towns in the Fitzroy River Catchment: Derby (population ~3,500) and Fitzroy Crossing (population ~1,300), and 57 smaller Aboriginal communities. Combined, the catchment has a population of about 7,500 (Merrin, Addison, & Austin, 2018). Much of the catchment is subject to native title (Figure 1-3). Overall, the population has a very high level of socioeconomic disadvantage, with high unemployment. There is a lack of settlement, communications and transport infrastructure in the Fitzroy River Catchment, with no rail network and a sparse road network—most of the catchment is accessed by unsealed minor roads.

Traditional Owners relevant to the Proposal are the Yungngora people (represented by the Yungngora Aboriginal Corporation RNTBC) and the Warlangurru 1 Native Title Claimants. Table 5-35 lists the proposed well sites and their distance from the nearest communities and towns.

Most of the Yungngora people live in the Yungngora Community. The community is ~28 km from the nearest well site (Jotunheim) and ~88 km west southwest (~170 km by road) from Fitzroy Crossing, with limited road access and communications (Figure 1-3). Most Warlangurru 1 Claimants also live in Yungngora Community with other members living in Jimbalakudunj Community, which is ~20 km northwest of the proposed Nidavellir well site. As outlined in Section 2.7, close consultation and engagement has occurred with the Yungngora and Warlangurru Peoples regarding petroleum activities on their native title areas. This has occurred over many years and includes the proposed activities. The Aboriginal communities support the Proposal.

5.5.3.2 Surrounding land use

As further detailed in Section 3.2.1 and Section 2.7, the Canning Basin is covered by rangeland ecosystems, with the project area overlaying two pastoral stations (leased Crown Land)—Blina Station and Noonkanbah Station—that are leased for pastoral grazing purposes.

The well locations are remote from residential developments, local tourist attractions and main roads. The closest receptors to the project area include a small number of station homesteads and Aboriginal communities (Figure 1-3), which are tens of kilometres away. Table 5-35 details well site locations relative to their nearest town or community.

Table 5-35: Pastoral station, native title area, and closest community to the project area

Pastoral station	Well site name	Native title area	Closest town or community
Noonkanbah Station	Jotunheim	Noonkanbah	Yungngora Community, ~28 km south Fitzroy Crossing, ~82 km east
	Midgard	Noonkanbah	Jimbalakudunj Community, ~31 km northwest
	Alfheim	Noonkanbah	Yungngora Community, ~33 km south-southeast
	Muspelheim	Noonkanbah	Jimbalakudunj Community, ~31 km northwest
	Vanaheim	Noonkanbah	Yungngora Community, ~32 km south
	Proposed Well Site 1	Noonkanbah	Yungngora Community, ~32 km south
	Proposed Well Site 2	Noonkanbah	Yungngora Community, ~32 km south-southwest Fitzroy Crossing, ~66 km east
	Proposed Well Site 3	Noonkanbah	Yungngora Community, ~30 km southwest Fitzroy Crossing, ~66 km east-northeast
	Proposed Well Site 4	Noonkanbah	Yungngora Community, ~33 km southwest Fitzroy Crossing, ~55 km east-northeast
Blina Station	Nidavellir	Warlangurru	Jimbalakudunj Community, ~20 km northwest Camballin Town, ~62 km west

5.5.3.3 Amenity and aesthetics

It is difficult to describe in words the amenity and aesthetics of a place. Instead, BNR has used photographs taken during the 2021 monitoring program to attempt to capture the amenity and aesthetics of the project area and the essence of a region that comprises a rugged outback environment of rolling plains.

As detailed in Section 5.5.3.2, the project area overlies two pastoral stations. The natural environment is intersected by pastoral station land use. The landscape is ever changing throughout the year due to changing seasons and the presence of grassfires.

Most well sites associated with the Proposal are located off the Calwynyardah–Noonkanbah Road, thus the amenity and aesthetics along this access way has been considered in the baseline assessment.

Figure 5-40: Calwynyardah–Noonkanbah Road at the northern end of the project area

Figure 5-41: Pindan vegetation and trees along Calwynyardah–Noonkanbah Road at the northern end of the project area

Figure 5-42: Sand dunes and associated hill tops add to the landscape along the Calwynyardah–Noonkanbah Road

Figure 5-43: Cattle grids, fences, and pastoral tracks are present all along the Calwynyardah–Noonkanbah Road

Figure 5-44: Pastoral fence line track during the wet season leading off from the Calwynyardah–Noonkanbah Road

Figure 5-45: Pastoral fence line track during the dry season leading off from the Calwynyardah–Noonkanbah Road

Figure 5-46: Grassy pastoral track during the wet season

Figure 5-47: Grassy pastoral track during the dry season

Figure 5-48: Cattle roaming free along an existing petroleum access track off Calwynyardah–Noonkanbah Road

Figure 5-49: Areas cleared by cattle gathering around water sources, located away from Calwynyardah–Noonkanbah Road

Figure 5-50: Legacy pastoral station buildings with radio tower (can be seen from Calwynyardah–Noonkanbah Road ~700 m away)

Figure 5-51: Historical anthropogenic material is scattered throughout active pastoral land; includes petroleum infrastructure reclaimed by the stations

Figure 5-52: Dry grassy plains around the southern end of the project area

Figure 5-53: Dry grassy plains are particularly subject to fires in the dry season

5.5.3.4 Culturally significant flora species

As part of the flora and vegetation survey undertaken for the Proposal, an ethnobotanical analysis was also completed to identify and record the location of any culturally significant bush foods for Traditional Owners. Two flora species considered as significant bush foods for Traditional Owners were recorded within the proposed disturbance footprint and wider Development Envelope—Boabs (*Adansonia gregorii*) and Conkerberries (*Carissa lanceolata*) .

Boab trees (Traditional Owner name: jumuluny) were recorded as a dominant or associated species within five of the 14 vegetation communities described, at <5% cover. One particularly large Boab tree was found growing across a portion of the access track leading to the Midgard well site—BNR intends to deviate the access track around this tree so that it is not adversely impacted.

Boabs are a Kimberley icon, occurring throughout the Kimberley and into the Northern Territory. Typically, they are 10–15 m tall and 9–12 m wide (DBCA, 2021). The tree produces a hard pod containing a white, powdery fruit (pith), which contain 10–20 (or more) seeds. The pith is commonly crushed and mixed with water and bee honey (sugarbag) droplets and then eaten. The seeds can be dried and eaten like peanuts. The Boab also has other uses—in Traditional Owner cultures, the bark is used to make strong, thick twine; the trunk produces water; and the fruit is used for medicinal or artistic purposes (Low, 1991; Martin, 2014).

Conkerberry (Traditional Owner name: piriyalji) was recorded as a dominant or associated species within 10 of the 14 vegetation communities described, at <5% cover. While the Conkerberry is native mainly to the Northern Territory and central Australia, it is also found in the Kimberley region. In a hot, dry climate this species grows on a wide range of terrains and soil types. The Conkerberry is a multi-stemmed shrub, 1–3 m high. The small berries, also known as bush currants, are 1–2 cm long and appear in February to March; they turn dark purple or black when ripe. Traditional Owners frequently eat Conkerberries, as they have a sweet, refreshing taste. The Conkerberry has other traditional uses, including burning the wood to create smoke to treat colds and coughs, burning the orange roots to keep bad spirits away, or as an insect deterrent (Low, 1991; Martin, 2014).

Because Boabs and Conkerberries occur extensively throughout the area, and because ground-disturbing activities will avoid any significant Boabs, BNR does not believe that the Proposal's activities will result in a significant impact to culturally significant flora species. As such, potential impacts to significant flora species to Traditional Owners from the Proposal are not considered further.

5.5.3.5 Indigenous and non-indigenous cultural heritage

5.5.3.5.1 Native title

The project area is overlapped by two registered native title groups—the Warlangurru People (claim application WAD509/2015, also known as the Warlangurru 1 Claim) and the Yungngora (Noonkanbah) People (determination application WAD6229/1998, also known as the Yungngora Native Title Determination) (Figure 1-3).

Because the Proposal occurs within the boundaries of the Warlangurru and Noonkanbah native title areas, members of these native title groups are key stakeholders for the Proposal. BNR closely consults and engages with these stakeholders and will continue to do so throughout the development of the Proposal (Section 2.7). An ILUA and LAUA are in place respectively with the Yungngora (Yungngora Aboriginal Corporation RNTBC) and Warlangurru Peoples.

Under these agreements, the Yungngora and Warlangurru people support the further appraisal and development of the gas resources in the area and support future grants of tenure, as required. The agreements include structured processes for managing cultural, heritage, and environmental matters in relation to BNR's proposed exploration activity within these native title areas.

5.5.3.5.2 Heritage sites

Several relevant heritage and due diligence surveys have been conducted within EP 371 that inform the baseline receiving environment described in this section. Table 5-36 lists previous and recent studies relevant to the Proposal, and the locations of recent heritage surveys for the Proposal are shown in Figure 5-54.

Table 5-36: Previous heritage surveys

Date	Survey name	Location	Heritage status
September and October 2021	Heritage survey for the Valhalla Gas Exploration and Appraisal Program	Blina and Noonkanbah stations	Cleared with conditions
May 2012	Heritage survey for Asgard 2D seismic survey	Blina and Noonkanbah stations	Cleared with conditions
May 2012	Heritage survey for Eden 2D, Asgard 2D, Valhalla 2D seismic, and Asgard 1 well site seismic survey	Blina, Liveringa, and Noonkanbah stations	Cleared
February 2012	Heritage survey for the Valhalla North A, Valhalla East 1 well sites	Noonkanbah Station	Cleared
October 2011	Heritage survey for the Valhalla North A, B, and C, Valhalla East well sites	Blina and Liveringa stations	Cleared
July 2009	Heritage survey for the Paradise 2D seismic survey	Blina and Liveringa stations	Cleared with conditions
August 2007	Heritage survey for the Paradise / Noonkanbah 2D seismic survey	Blina, Liveringa, and Noonkanbah stations	Cleared

A search of the WA Government's Aboriginal Heritage Inquiry System identified that two registered Aboriginal heritage sites are within the Development Envelope (Figure 5-54):

- Dunggaba Complex 1 (Mythological – site 14215)
- Walgidee Hills 4 (Mythological – site 14224).

Two sites listed as other heritage places are also within the Development Envelope (DPLH, 2021a):

- No. 19 bore (Mythological – site 13851)
- No. 20 bore (Mythological – site 13852).

Various heritage surveys have been undertaken by previous oil and gas operators of EP 371 (Table 5-36), including surveys specifically for the Valhalla Gas Exploration and Appraisal Program (as shown in Figure 5-54). Although no Proposal wells are located within any known heritage sites, the proposed access track to the Alfheim well site crosses the No. 19 bore (other heritage place [not registered]). During heritage clearance surveys completed by BNR in 2021, it became clear that access for stock to existing dams and bores is of high concern and importance. As such, on request from the Traditional Owners, the access track was diverted around the existing dam (and outside of the area of importance [No. 19 bore]) so that no disturbance or unplanned impact (direct or indirect associated with traffic) would occur (Deep Woods Surveys, 2021). It should be noted that the heritage survey report has been provided on a confidential basis to the EPA and not attached to the ERD given cultural sensitivities and confidentiality associated with this piece of work.

In consultation with the Yungngora and Warlangurru Traditional Owners, a pre-disturbance ethnographic and archaeological heritage survey of the Proposal's disturbance footprint was undertaken in September and October 2021. Access tracks, camps and well sites were surveyed. No Aboriginal sites with an archaeological component were found in any parts of the proposed disturbance footprint (Deep Woods Surveys, 2021). Outcomes of the heritage surveys are further discussed in Section 5.5.5.6.

Disturbance of Aboriginal heritage sites is managed through Department of Planning, Lands and Heritage (DPLH) licencing in accordance with:

- s 16 authorisation to enter, excavate, examine or remove anything on an Aboriginal site.
- s 18 consent for impact on an Aboriginal site.

Although the Disturbance Footprint crosses the No. 19 heritage site – engagement with the Traditional Owners verified that no impacts to the site will occur (based upon realignment of the track). It should be noted that although BNR aligned the access track, the Disturbance Footprint still intersects the No. 19 heritage site due the geospatial buffer applied to the site. As such BNR will still be required to apply for s 16 approval (to enter the defined heritage site) even though Traditional Owners have validated that no impacts to the site will occur.

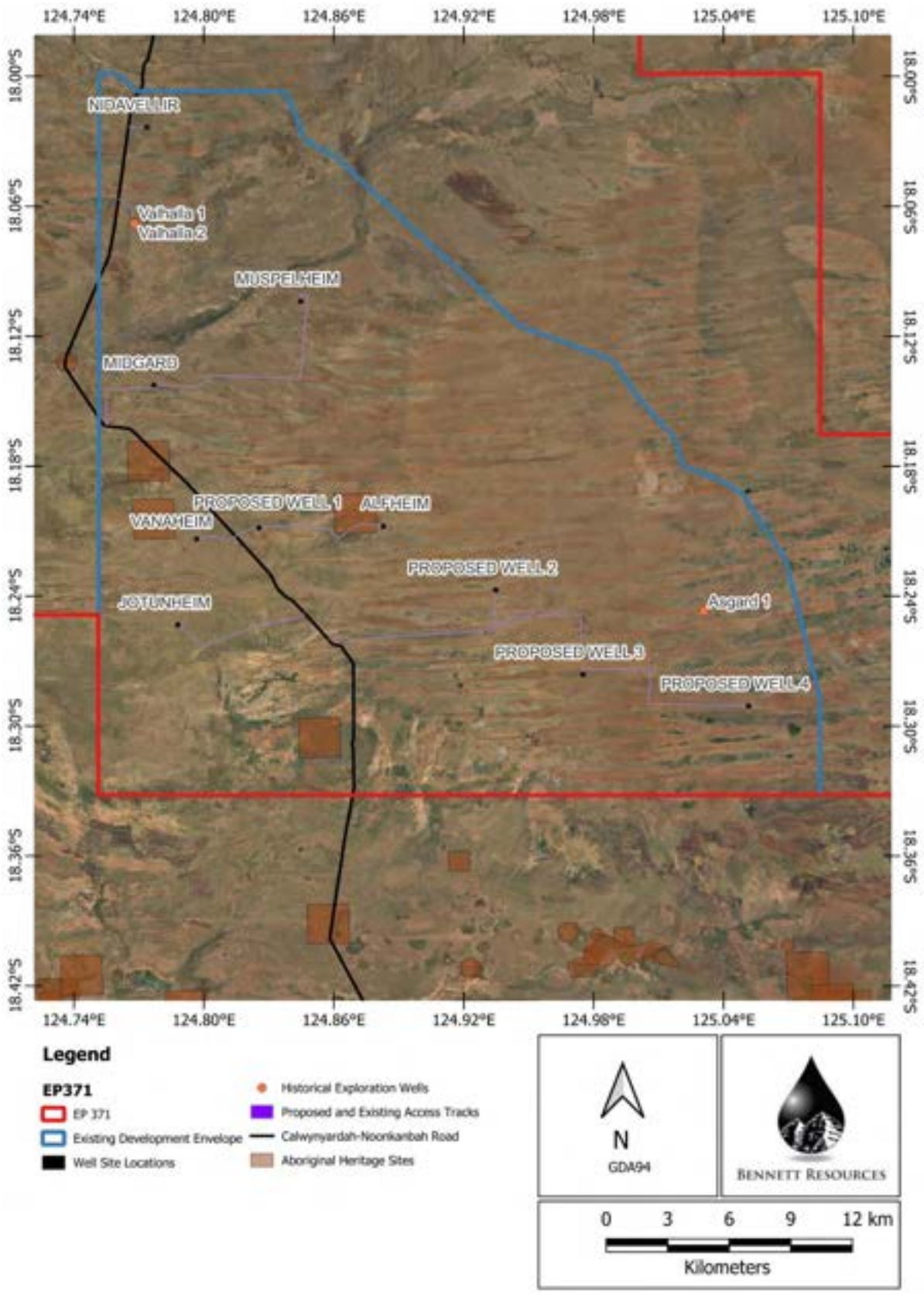

Figure 5-54: Location of heritage places with most recent heritage survey undertaken within the Proposal's disturbance footprint

5.5.3.6 Natural heritage

A search of the WA Government's InHerit database did not identify any registered natural heritage sites (statutory heritage listings) within or adjacent to the Development Envelope (Heritage Council, 2021). No sites listed on the National Heritage List occur within EP 371 (DAWE, 2021c). The nearest National Heritage List site is the West Kimberley (Listed Place – Heritage Place No. 18769), ~7.5 km south of the project area (Figure 5-55). The West Kimberley Heritage Place No. 18769 is important due to its great biological richness and contains important geological and fossil evidence of Australia's evolutionary history. Given the distance of the proposed activities from this listed heritage place, it is not considered further.

A search of the Australian Heritage Database (DAWE, 2021c) identified one site within the Development Envelope classed as a 'natural, indicative place' under the Register of the National Estate (non-statutory archive)—the Walgidee Hills Lamproite Site (Place ID: 101095). The Walgidee Hills Lamproite Site is on Noonkanbah Station, ~11 km south of the Alfheim well site. Although it does not have statutory heritage listing, it has been classified as a 'Landscape' by the National Trust since 1991 (Heritage Council, 2021).

5.5.3.6.1 Iconic natural heritage places

As part of the response to the recommendations and findings of the Report by the Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia (2018), the WA Government has undertaken an assessment and public consultation process to identify 'Places of Iconic Natural Heritage', using guiding identification principles (Government of Western Australia, 2019). After the public consultation period and consideration of submissions, the two proposed iconic natural heritage places—the Fitzroy River and the Camballin Floodplain—were extended to include additional parts of the Kimberley National Heritage Listed Area (Government of Western Australia, 2021d). Hydraulic fracturing will not be permitted where iconic natural heritage places intersect with existing petroleum titles.

The Proposal is not located within any of the iconic natural heritage places (Figure 5-55). The nearest iconic natural heritage place is the intersection of Mount Hardman Creek with the Calwynyardah–Noonkanbah Road, 4 km west of the proposed Midgard well site and outside the Development Envelope boundary. This iconic natural heritage place has the same coordinates as the registered Aboriginal heritage site Mt Hardman Creek (Mythological – site 14229).

5.5.3.6.2 World and Commonwealth heritage

No world heritage sites or Commonwealth heritage sites occur within EP 371 (DAWE, 2021c).

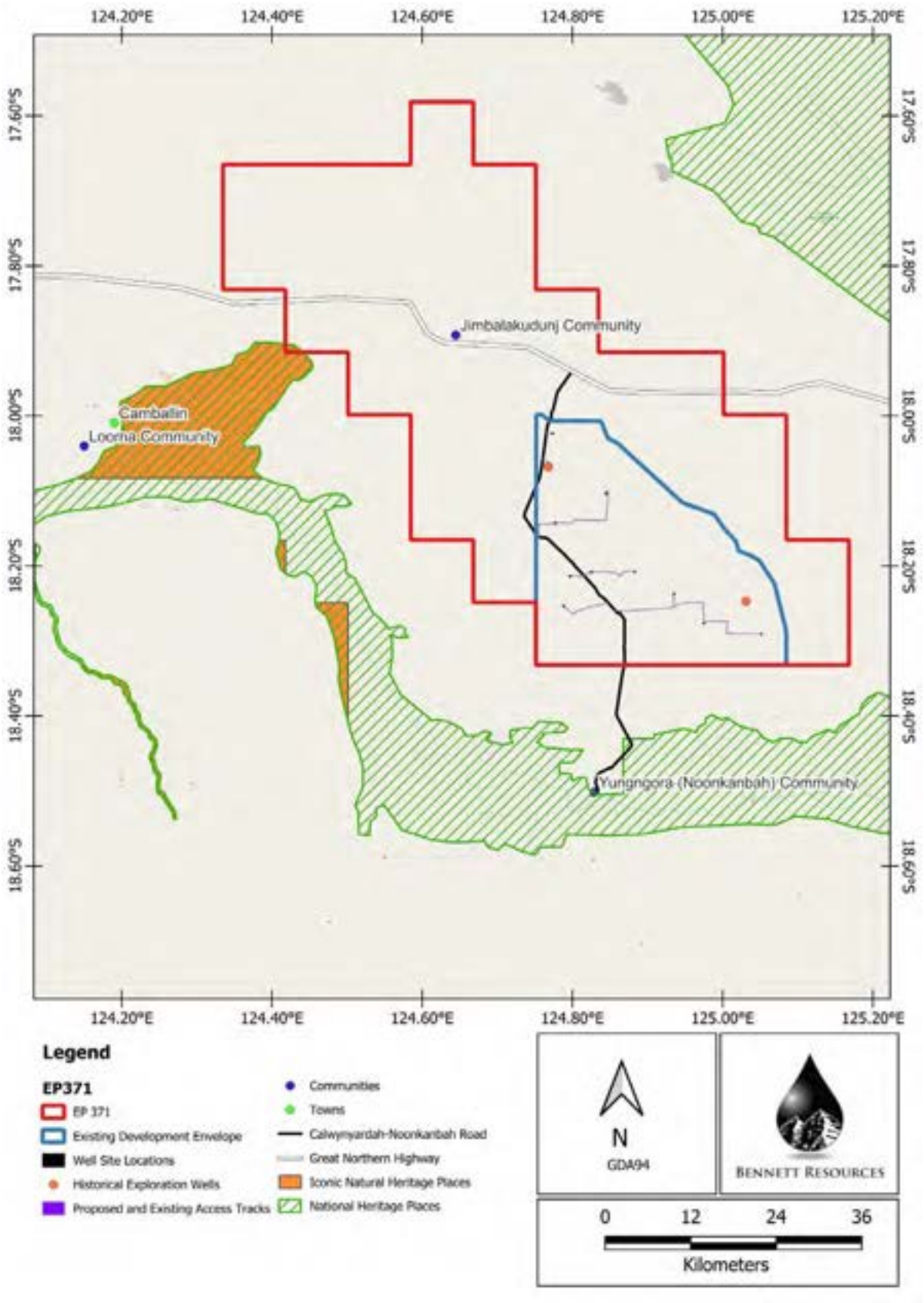

Figure 5-55: Natural and iconic natural heritage areas near EP 371

5.5.3.7 Dust

Dust is the generic term used to describe solid airborne particles generated and dispersed into the air by processes such as handling, crushing and grinding of organic or inorganic materials such as rock, ore and wood (DEC, 2011). Vehicle and heavy machinery movements on unsealed surfaces, along with material stockpiles, contribute to the generation of dust and dispersal of particulate matter (PM).

Ambient air quality in the region is strongly influenced by season. During the winter dry season (June–August), southeasterly winds predominate. While dust storms blowing in from the Great Sandy Desert region may occur, these are rare. Between 1992 and 2010, the Dampierland bioregion had a mean dust storm index of 0.5 (McTainsh, O'Loingsigh, & Strong, 2011), which is considered very low compared with all other rangeland bioregions (Bastin & ACRIS Management Committee, 2008) (for comparison, the Great Sandy Desert bioregion's dust storm index is 1.7).

As part of the Air Quality Monitoring Program (Appendix E), baseline dust was monitored continuously for six months during the 2021 dry season (Appendix H). Five air quality monitoring stations were installed, including two near the two local Aboriginal communities. These recorded PM and depositional dust (comprising ash content, combustible matter, and total insoluble matter). A map showing the locations of the monitoring stations and baseline data are presented and further discussed in the Air Quality environmental factor in Section 5.6.3.1.

5.5.3.8 Noise

Given the remoteness of the region, baseline (background) noise within the Development Envelope and surrounds before commencing the Proposal is expected to be very low. The closest main road is Great Northern Highway, which is ~4.5 km north of the Development Envelope. Some smaller roads such as the gravel Calwynyardah–Noonkanbah Road and pastoral tracks are present within the wider region around the proposed well sites, but traffic is rare. Constant road traffic noise is not expected to be heard in such a region, which is distant and isolated from the main towns. No airstrips are near the proposed well site locations. Therefore, no aircraft noise is expected. Some occasional helicopter noise may be heard near the well sites during mustering activities.

Baseline noise was recorded continuously for one week in August 2021, then post-processed to generate 15-minute logging periods. Three field-calibrated noise loggers were installed near the air quality monitoring stations within and outside the Development Envelope. These noise loggers were positioned ~20–30 m away from the air quality stations to avoid recording the constant low-level noise generated by the stations' operating pump fans.

Table 5-37 summarises the outcomes of the baseline noise monitoring survey. A further breakdown of noise levels is presented in Appendix O. Results show that the baseline noise levels are consistent with remote locations not heavily influenced by human activity. Diurnal fluctuations in noise levels were influenced by bird song and insects that are active at dawn and evening / early night (Marshall Day Acoustics 2021 [Appendix O]). An extract of the time history plot for the noise logger placed ~5 km away from the Yungngora Community (logger 3) is presented in Figure 5-56. Brief periods of elevated noise levels (spikes in L_{Amax} levels) are likely due to vehicles passing or when birds or insects were near or on the microphone. This was confirmed through audio sampling on the loggers. As expected in remote locations, the average minimum background sound level was below L_{A90} 20 dB during night at all locations, with the lower night-time assigned noise level (average maximum noise level) around L_{A10} 35 dB.

Table 5-37: Day, evening, and night ambient noise levels within EP 371

Logger	Location (coordinates)	Comments
Logger 1	−17.898625 124.669033	Equipment: 01dB Cube® Wind shield Positioned on an infrequently used pastoral access track (~670 m from Great Northern Highway)
Logger 2	−18.262381 124.862839	Equipment: 01dB Cube® Wind shield Positioned near the Calwynyardah–Noonkanbah Road (~85 m away)
Logger 3	−18.463469	Equipment: 01dB DUO®

Logger	Location (coordinates)	Comments
	124.857686	Wind shield Positioned near the Calwynyardah–Noonkanbah Road (~115 m away), ~5 km north of the Yungngora Community

Day (07:00–19:00)	L_{A90} (dB)	L_{A10} (dB)	L_{Amax} (dB)
Logger 1	34	42	56
Logger 2	43	52	44
Logger 3	32	44	55
Evening (19:00–22:00)			
Logger 1	31	42	50
Logger 2	46	51	57
Logger 3	43	48	52
Night (22:00–07:00)			
Logger 1	25	36	63
Logger 2	34	39	51
Logger 3	26	28	43

L_{A10} – The noise level exceeded for 10% of the sample period. This is commonly referred to as the average maximum noise level.

L_{A90} – The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Amax} – The maximum instantaneous noise level occurring during the sample period.

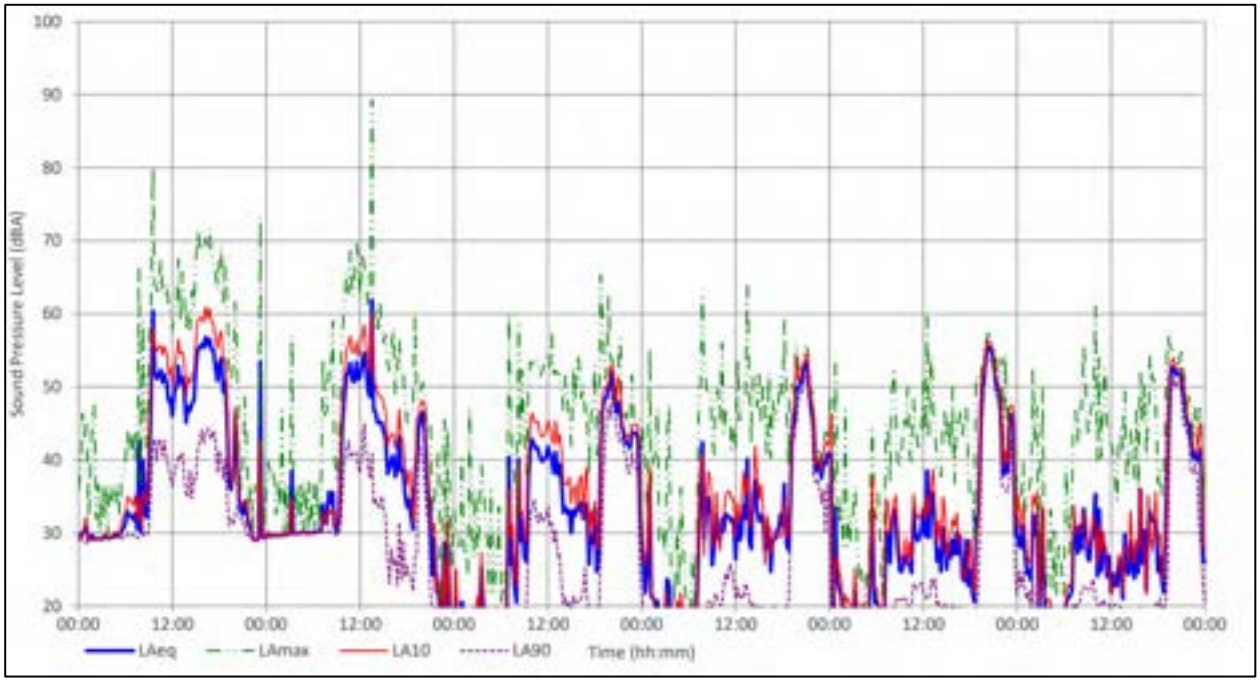

Figure 5-56: Noise logger 3 – time history plot of noise levels recorded between 17 – 22 August 2021 (Figure 3 in Marshall Day Acoustics 2021 [Appendix O])

5.5.3.9 Traffic

Main Roads (2020) records the average number of vehicles and heavy vehicles travelling at and between WA locations. Statistics about traffic volumes and percentage of heavy vehicles using key roads in the Kimberley region are available for the most recent six years.

The Development Envelope is ~4.5 km south of the closest main sealed road—Great Northern Highway. It is expected that equipment and machinery would be mobilised along the Great Northern Highway and then onto the rural track that is the main access road to the well sites. The ~72.5 km long Calwynyardah–Noonkanbah Road runs between Great Northern Highway and the Yungngora Community. This public unsealed access road is listed in the SDWK's road assessment and maintenance management database and is well maintained by the shire (SDWK, 2020) and Yungngora Association Incorporated (YAI) (the leaseholder of Noonkanbah Station), who use local contractors to grade the road one to two times a year. Although classed as a public road, the Calwynyardah–Noonkanbah Road is restricted to those accessing the Yungngora Community, pastoral station workers and those associated with industry assets or tenements on the land. Traffic volumes on this road are known to be low. Local publicly available traffic data from the SDWK show that the annual average daily traffic is between 20 and 100 vehicles (SDWK, 2020).

Baseline traffic was monitored continuously over five weeks in July–August 2021 (Appendix Q). The traffic monitoring equipment (one traffic logger with a pair of tubes) was installed along the Calwynyardah–Noonkanbah Road within the Development Envelope and recorded the classes (Austroads vehicle classification system), speed, and number of vehicles travelling. The results of this baseline survey were shared with the SDWK with the aim of updating local traffic records.

BNR divided the data into two vehicle classifications—Light (Class 1–2) and Heavy (Class 3–12). Light vehicles include sedans, wagons, 4WDs, and motorcycles. Heavy vehicles comprise two-axle trucks, buses, triple road trains, and heavy trucks with 3 trailers.

Over the five-week monitoring period, daily average usage ranged from ~20 vehicles (on Tuesdays) to ~49 vehicles on Thursdays (Figure 5-57). Most road users were predominantly light vehicles, with heavy vehicles comprising ~6% of the total vehicle use (per day). Because the road is used predominantly for commnuity access and pastoral activities, the traffic volumes and breakdown are consistent with pre-monitoring expectations.

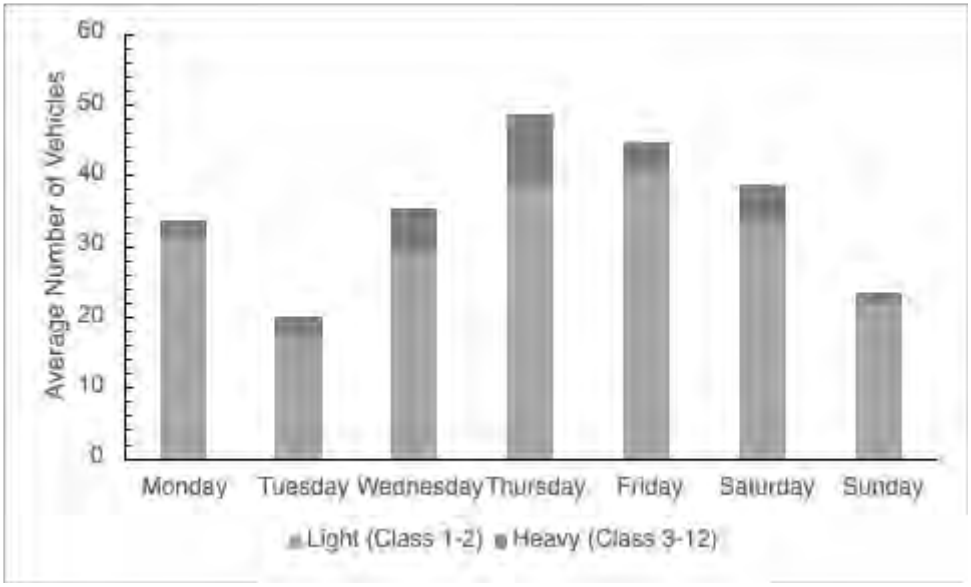

Figure 5-57: Average daily vehicle usage numbers for the Calwynyardah–Noonkanbah Road

To better understand potential traffic impacts at a regional level, Table 5-38 lists publicly available regional statistics for Great Northern Highway. Note: Great Northern Highway, east of Derby Highway, provides the most accurate traffic information for access into EP 371. Statistics recorded by Main Roads (2021) showed a record increase of traffic travelling in the West Kimberley (due to influx of Australian tourism), as seen as the significance increase in the average number of vehicles per day in Table 5-38.

Table 5-38: Road-use statistics for the Great Northern Highway in the Kimberley (Main Roads, 2020; Main Roads, 2021)

Location along the Great Northern Highway	Continuous monitoring	Average number of vehicles at each location for a typical day *(% of heavy vehicles)*							
		2014–2015	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021	2021–2022
South of Broome Road	Yes	340 *(31.1)*	440 *(29.4)*	-	-	490 *(27.2)*	430 *(29.9)*	440 *(26.6)*	740 *(23.3)*
East of Derby Highway	Yes	-	-	-	-	470 *(32.8)*	-	-	-
West of Derby Highway	Yes	540 *(20.6)*	570 *(18.7)*	570 *(18.1)*	590 *(19.5)*	570 *(20.2)*	570 *(20.6)*	580 *(18.9)*	870 *(20.1)*
East of Derby Highway		-	540 *(33.5)*	-	-	-	-	-	-
East of Fitzroy Crossing	Yes	350 *(23.4)*	370 *(19.6)*	360 *(19.2)*	400 *(19.6)*	400 *(20.3)*	390 *(21.6)*	360 *(39.3)*	-
East of Halls Creek	Yes	-	-	-	-	430 *(24.7)*	340 *(24.1)*	340 *(24.1)*	480 *(22.2)*
South of Victoria Highway	Yes	340 *(30.7)*	350 *(23.6)*	330 *(21.3)*	330 *(23.0)*	340 *(24.6)*	360 *(30.4)*	360 *(39.4)*	530 *(31.5)*

5.5.4 Potential impacts

5.5.4.1 Direct impacts

No sensitive receptors were identified for the Proposal; therefore, the activities are not expected to result in landscape and visual impacts. Direct impacts from the Proposal's activities may include:

- increased dust emissions
- increased noise and vibration emissions
- increased traffic movement
- disruption to existing land users
- social and economic benefits
- impacts to workers' health.

5.5.4.2 Indirect impacts

Unplanned events may lead to indirect impacts including:

- potential impacts to heritage sites
- amenity and aesthetics
- local social impact arising from mental health and wellbeing, due to impacts from changes to the physical or biological environment.

5.5.5 Assessment of impacts

5.5.5.1 Increased dust emissions

5.5.5.1.1 Impacts to ecosystem health

Dust emissions generated by the Proposal's activities have the potential to extend outside the disturbance footprint, potentially impacting local vegetation. Dust impacts on vegetation are discussed for the flora and

vegetation environmental factor in Section 5.1.5.4 and noted in the air quality environmental factor in Section 5.6.5.2, and thus are not repeated here.

5.5.5.1.2 Impacts to public health

Dust emissions resulting from the Proposal can affect human health and decrease amenity in surrounding areas (dust reduces visibility and settles on surfaces, causing soiling and staining) (DEC, 2011). Typically, during early stages of site preparation and construction, dust is generated from vegetation clearing and activities on unsealed surfaces. Dust can be present as a $PM_{2.5}$ (fine particulate matter with a diameter of 2.5 micrometres or less) or PM_{10} pollutant (diameter of 10 micrometres or less), which can cause reduced air quality, acute and chronic health effects. The potential impact of dust is determined by particle size, chemical composition, and concentration (DEC, 2011). The total suspended solid fraction of dust is typically responsible for nuisance or loss of amenity, whereas the smaller PM_{10} and $PM_{2.5}$ fractions are more commonly associated with the potential for health impacts because they have the ability to penetrate lungs (DEC, 2011).

A dust risk assessment and site classification for well site activities covered under the Proposal was completed in accordance with the DEC (2011), and is summarised in Table 5-39.

Table 5-39: Dust risk assessment for a proposed well site based upon DEC (2011)

Item	Score options				Allocated score for the Proposal
Part A					
1. Nuisance potential of soil, when disturbed	Very low (1)	Low (2)	Medium (4)	High (6)	4
2. Topography and protection provided by undisturbed vegetation	Sheltered and screened (1)	Medium screening (6)	Little screening (12)	Exposed and wind prone (18)	18
3. Area of site disturbed by the works	<1 ha (1)	Between 1 and 5 ha (3)	Between 5 and 10 ha (6)	More than 10 ha (9)	6
4. Type of work being done	Roads or shallow trenches (1)	Roads, drains, and medium-depth sewers (3)	Roads, drains, sewers, and partial earthworks (6)	Bulk earthworks and deep trenches (9)	1
				TOTAL score for Part A	**29**
Part B					
1. Distance of other land uses from site	>1 km (1)	Between 1 km and 500 m (6)	Between 100 m and 500 m (12)	Less than 100 m (18)	1
2. Effect of prevailing wind direction (at time of construction) on other land uses	Not affected (1)	Isolated land uses affected by one wind direction (6)	Dense land uses affected by one wind direction (9)	Dense or sensitive land uses highly affected by prevailing winds (12)	1
				TOTAL score for Part B	**2**
				SITE CLASSIFICATION SCORE (A x B)	**58**

Based on the assessment criteria, the Proposal is considered to be classified under Site Classification 1; i.e. considered a negligible risk with no specific provisions or contingency arrangements required (DEC, 2011). This is consistent with the remote nature of the proposed project and the proximity to receptors. Consequently, the Proposal is not expected to cause a significant environmental and health impact associated with dust generation. This is consistent with the Human Risk (Scoping) assessment provided in Appendix N. Further detail on impacts to public health and receptors are discussed in the air quality environmental factor in Section 5.6.5.1.

5.5.5.2 Increased noise and vibrations

Noise monitoring studies have indicated that, for an average well construction site, noise emissions are ~65 dB(A) at 150 m from the location of any drilling Radtke, Autenrieth, Lipsey, & Brazi, 2017).

The previous operator of EP 371 conducted a noise monitoring program during HFS activities. Noise loggers were installed ~1 m from the noise source and ~800 m from the well site where HFS was being undertaken. Monitoring was done over two days during start-up, warm-up and shutdown of equipment and engines. Noise loggers located ~1 m from the source recorded noise levels from 89–106 dB(A) during engine warm-up / idling and 95–108 dB(A) during pumping (Buru Energy, 2014). Noise levels recorded during this monitoring program identified that HFS activities typically produce noise levels <65 dB(A) 800 m away from the source.

To further understand the extent of potential impact associated with the Proposal, BNR completed a baseline noise monitoring program (Section 5.5.3.8), and used this information to complete a quantitative model, as required by ESD Item 46. Modelling results (Appendix P) predict that for a noise of ~110 dB (e.g. originating from operating HFS pumps), noise levels are expected to reach below the maximum allowable external noise level (35 dB L_{A10}) at ~2,500 m away from the noise source, as shown in the noise contour plot in Figure 5-58. The closest sound sensitive receptor is >18 km from the project area. Modelling was based on known and assumed noise levels from equipment proposed to be used during the Proposal. An overall, worst-case operating scenario was developed—all equipment operating at the same time at each proposed well site. Note: Activities are likely to be only conducted at one well site at a time. Calculated noise levels associated with this worst-case operating scenario were <10 dB(A) at both the Jimbalakudunj and Yungngora Communties.

In accordance with the definitions provided in the Environmental Protection (Noise) Regulations 1997, no noise sensitive premises, commercial or industrial premises are located within the Development Envelope. With no fixed sensitive receptors nearby that can be exposed to the Proposal's increased noise levels, noise emissions from the Proposal are not expected to result in a significant impact to social surroundings.

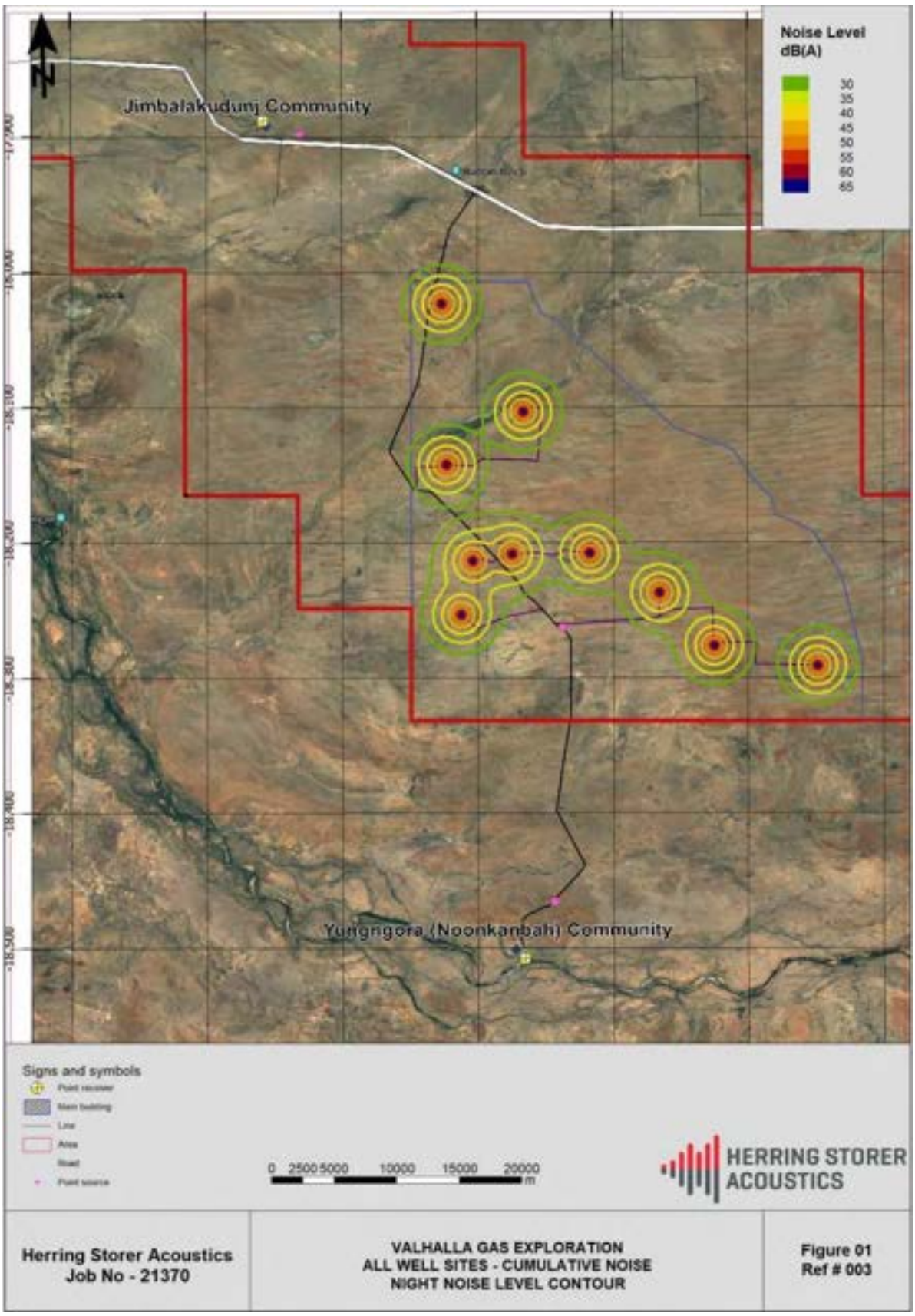

Figure 5-58: Worst-case noise level contour plot (Appendix P)

5.5.5.3 Disruption to existing land users

The Proposal is located on the Blina and Noonkanbah stations, which are on the Warlangurru and Noonkanbah native title areas, respectively. As further detailed in Sections 2.7, 3.2, and 5.5.3.2, these are active pastoral stations that have free-roaming cattle. Yungngora people from the Yungngora Community are employed by Noonkanbah Station and regularly travel on the station to verify cattle presence, check feedstock, fence lines, groundwater pastoral bores and associated watering troughs. Blina Station workers occasionally travel to the southern border of Blina Station, which intersects the northern section of the Development Envelope, to verify their cattle and check station equipment.

Blina and Noonkanbah stations have total areas of 254,600 ha and 172,400 ha, respectively. The clearing footprint of this Proposal is limited to 110 ha, thus the potential direct impact is limited to <0.026% of the total pastoral stations' area, and is considered negligible to existing pastoral activities. Further, the Proposal will not significantly disturb cattle (who already gather around current petroleum activities in the permit), and the additional access tracks created for the Proposal's activities will likely be used by pastoralists for their activities. Therefore, the Proposal is not expected to result in a significant disruption to pastoral activities.

In addition to pastoral activities, the Traditional Owners of the land and members of the Yungngora Community and Jimbalakudunj Community use the land within and surrounding the Development Envelope for cultural and recreational reasons, such as education, hunting, gathering, fishing and swimming. Over the past 10 years, BNR and the previous operator have proved that oil and gas activities can exist with cultural activities. BNR has a strong relationship with the Traditional Owners, who actively support BNR to complete routine inspections of existing BNR infrastructure and assets. The Traditional Owners are made aware of all BNR presence and activities on site, and discussions are ongoing regarding the participation and employment of community members in the Proposal's activities. The community supports current and future work opportunities on EP 371.

5.5.5.4 Increased traffic movement

Although the remoteness of the areas may present logistical challenges, it does mean that impacts to amenity are mitigated by the absence of nearby receptors. Increased traffic in the area may present a possible impact on amenity. However, the region where the Proposal is to occur is sparsely populated and the surrounding area is used for pastoral activities. Additionally, vehicle movements on the roads in the region are infrequent (Appendix Q), even on Great Northern Highway, the nearest major road (Table 5-38).

To understand the potential impacts associated with traffic for the Proposal, Table 5-40 summarises the traffic movements expected to be required for each activity covered in the Proposal.

Based on the expectation that the average number of moves per day related to the Proposal could be as high as 20 loads (during the HFS stage), the increase to regional road traffic along Great Northern Highway is calculated to be <6% of the total number of vehicles that would be expected to be encountered on an average day. This is based on traffic data collected east of Fitzroy Crossing (Table 5-38). Consequently, the increased traffic on major transport routes is not expected to result in significant impacts to regionally important roads.

Locally, monitoring completed by BNR in July and August 2021 identified that the average daily traffic movements along the Calwynyardah–Noonkanbah Road is ~35 vehicles, which is consistent with data from the shire that indicates the annual average daily traffic along the Calwynyardah–Noonkanbah Road is 20–100 vehicles (SDWK, 2020).

Using the highest average number of moves per day, BNR has estimated that the Proposal could result in a 60 per cent increase to road traffic along the Calwynyardah–Noonkanbah Road. As mobilisation periods are expected to be minimal (~2 weeks), any increased traffic attributable to the Proposal is not likely to significantly impact local road users as the road is of suitable quality to allow two directions of travel.

As mentioned in Section 5.5.3.9, the Calwynyardah–Noonkanbah Road is a public unsealed road maintained partly by SDWK (northern section) and partly by YAI (down to the Yungngora Community). Currently, grading of the road occurs after the wet season and maintenance of the road is organised where and when necessary throughout the dry season. The road has relatively low traffic volumes, and the traffic volumes resulting from the Proposal are not expected to have a significant influence on the safety of other road users. No specific upgrades to the Calwynyardah–Noonkanbah Road are required for the activities. However, BNR will liaise directly with SDWK and YAI regarding the frequency of road maintenance.

Access (dirt) tracks leading off from the Calwynyardah–Noonkanbah Road are only occasionally used by the Traditional Owners and pastoral stations (perhaps a couple of times a week for certain tracks), and less regularly by BNR (up to a couple of times a month). Vehicle movements associated with the Proposal are unlikely to result in impacts to traffic on local dirt tracks within the Development Envelope given that these (with the exception of one currently existing access track) are planned to be constructed specifically for the Proposal and only to access the proposed well sites.

Table 5-40: Indicative traffic requirements per well for the Proposal

Activity	Vehicle	Number	Mobilisation period (days)	Average number of moves per day
Site preparation	Flatbed truck (heavy machinery)	6	2	3
	Dump trucks (materials for hardstand construction)	40	14	~3
Drilling	Flatbed trucks (for drilling rig, mobile camp, bulk material, and related equipment)	50	7	7
	Service vehicles (heavy vehicles)	50	40	~2
HFS	HFS equipment, mobile camp etc.	40	4	10
	Triple road train – proppant sand	130	30	10
	Service vehicles (heavy vehicles)	50	25	~3
Site reinstatement	Flatbed truck (heavy machinery)	6	2	3

5.5.5.5 Social and economic benefits

During the HFS Scientific Inquiry (Independent Scientific Panel Inquiry, 2018), the Yungngora and Warlangurru people voiced their support for HFS activities on their native title areas located within EP 371. Table 5-41 lists the links to specific letters of support from these stakeholders.

Table 5-41: Letters of support for HFS during the HFS scientific inquiry

Stakeholder	Link to letters of support
Yungngora people	
Yungngora Aboriginal Corporation	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/yungngora_aboriginal_community_152_redacted.pdf
Neil Ewart (retired CEO of YAI)	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/ewart_neil_52_redacted.pdf
Germaine Muller (Chairperson YAI)	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/muller_germaine_142.pdf
Warlangurru People	
Michael Costaine	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/costaine_michael_147.pdf
Lazarus Costain	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/costain_lazarus_144.pdf
Benjamin Laurel	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/laurel_benjamin_133.pdf
Ronnie Lormada	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/lormada_ronnie_149.pdf
Anthony Mulligan	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/mulligan_anthony_308.pdf
Gabriella Mulligan	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/mulligan_gabriella_135.pdf
Judy Mulligan	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/mulligan_judy_137.pdf
Lucas Mulligan	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/mulligan_lucas_310.pdf
Rosie Mulligan	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/mulligan_rosie_150.pdf
Tojoe Mulligan	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/mulligan_tojoe_312.pdf
Leroy Nargoodah	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/nargoodah_leroy_138.pdf
Patrick Nargoodah	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/nargoodah_patrick_139.pdf

Stakeholder	Link to letters of support
Audrey Mulligan (Director of Warlangurru Aboriginal Corporation)	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/mulligan_audrey_140.pdf
Frankie Wangyella	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/wangyella_frankie_134.pdf
Natalie Wardsmith	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/wardsmith_natalie_311.pdf
Morrison Wulgarrie	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/wulgarrie_morrison_148.pdf
Douglas Yamera	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/yamera_douglas_136.pdf
Eric Yamera	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/yamera_eric_309.pdf
Kuminjay Yamera	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/yamera_grayton_143.pdf
Madeline Yamera	https://frackinginquiry.wa.gov.au/sites/default/files/webform/submissions/yamera_madeline_146.pdf

Support for petroleum activities amongst the Yungngora Community is based on individual community members' sound knowledge of HFS informed by an independent specialist review process that was undertaken by the previous operator of EP 371. BNR has continued to provide information through independent specialist subject matter experts, during multiple engagements with the Community in 2021, 2022 and 2023.

The outcomes of the independent specialist review are included with the Yungngora Aboriginal Corporation's submission to the HFS Scientific Inquiry (Independent Scientific Panel Inquiry, 2018) (see Table 5-41). The community has first-hand experience of the HFS process through their active involvement and participation in the 2015 HFS program on the permit. Equally important has been the trust between Yungngora Community members and the operators of EP 371 that has been developed by the transparent sharing of information and maximising the employment and contracting opportunities for community members.

During the 2015 HFS program, 33 workers from the community worked more than 14,000 hours on the program, in these areas:

- security and access control – Yungngora Community members were responsible for providing security and access control at all sites for the whole program, in partnership with security specialists. This involved maintaining a 24-hour ranger presence across areas of activity
- HFS spread – Yungngora Community workers were seconded to service companies during the program and worked alongside service company personnel doing equipment maintenance, loading sand, refuelling, and related jobs
- civil works – Yungngora Community members were responsible for maintaining the access tracks and well sites during the program. This included watering to supress dust
- camp services – Yungngora Community members worked in the temporary camp during the program.

During the program, the staff from the Kimberley Training Institute were on site to train, assess and certify community members. Fifteen people were trained and ticketed in security and in operating excavators, water carts, dump trucks, front-end loaders and bobcats, with 32 tickets awarded during the program.

Approximately 400 people (median age 22) live in Yungngora Community (ABS, 2016). Of the ~240 people who are of working age, >80 per cent are either unemployed or are supported through the Commonwealth-funded Community Development Program. The Proposal will provide an important source of employment and socioeconomic opportunities to the Yungngora Community, as well as SDWK and the West Kimberley region generally.

BNR has an ILUA and LAUA in place with the Yungngora and Warlangurru people, respectively (Section 5.5.3.5.1). These agreements include a focus on employment and training opportunities and programs, particularly for young people. BNR will continue to work closely with the Yungngora and Warlangurru people to maximise the opportunities the Proposal brings to their communities.

5.5.5.6 Impacts to workers' health

As per ESD Item 54:

Determine impacts to human health in relation to worker accommodation (particularly dust, water supply, wastewater disposal etc.) by using the Department of Health scoping tool

BNR engaged with the EPA to understand the extent to which the EP Act provides for the assessment and protection of worker health. EPA Services confirmed that worker health is not covered under the Act (Table 3-1).

BNR can confirm that worker health is to be assessed and regulated under the new *Work Health and Safety Act 2020* (WA), which will replace the *Occupational Safety and Health Act 1984* (WA) and elements of the PGER Act that relate to work health and safety. The PGER (Occupational Safety and Health) Regulations 2010 and the PGER (Management of Safety) Regulations 2010 currently regulate petroleum safety matters (e.g. through the approval of BNR's Safety Management System for its petroleum activities). Impacts to worker accommodation will be managed through different approvals, such as those listed, but not limited to, in Table 1-3 in Section 1.4.

Although the EPA assesses human (public) health through the Part IV human health environmental factor consideration, the EPA does not assess human worker health. As such, BNR has not conducted a detailed assessment of impacts to worker health as this will be managed under the *Work Health and Safety Act 2020* (WA).

5.5.5.7 Potential impacts to heritage sites

As described in Section 5.5.3.2, the Development Envelope is situated within two native title areas. Two registered heritage sites and two other heritage sites are present near the project area. No wells are located within any known heritage sites.

A heritage archaeological and ethnographical survey was conducted with native title representatives in September and October 2021 to identify if any heritage sites or material are present within the proposed disturbance footprint. After completing the survey and evaluating its outcomes, BNR reviewed the currently proposed well site, access track, and camp locations to ensure that, in line with the heritage survey results and advice, no damage to identified heritage sites or Traditional Owner heritage values would occur from the Proposal. It was determined that the proposed access track to the Alfheim well site should be deviated around the Aboriginal site No. 19 bore and a cattle yard. As detailed during the engagement with Traditional Owners during the heritage clearance survey, vehicle movement (along with associated dust, noise and air emissions) were of most concern given the potential to scare cattle away and prevent them from drinking at this location. As such, on request from the Traditional Owners, the access track was diverted around the existing dam (and outside of the area of importance [No. 19 bore]) so that no disturbance or unplanned impact (direct or indirect associated with traffic) would occur (Deep Woods Surveys, 2021). It should be noted that the heritage survey report has not been attached to the ERD given cultural sensitivities and confidentiality associated with this piece of work.

This deviation to the track has been reflected in all maps presented in the ERD and in the shapefiles provided to the EPA in the Index of Biodiversity Surveys for Assessments package.

Additionally, new locations for the proposed Muspelheim camp and for the proposed Muspelheim well site were also surveyed to relocate these areas further away from Mount Hardman Creek. These deviations and the new proposed locations were also surveyed for the presence of Traditional Owner archaeological sites—none were identified.

Apart from the diversions for the track, camp, and well site mentioned above, all other proposed disturbance footprint areas do not contain any significant cultural material, places, or sites, and BNR has the permission of the Yungngora Aboriginal Corporation and Warlangurru Aboriginal Corporation to proceed with the Proposal (Deep Woods Surveys, 2021). No heritage management plan was deemed necessary following the outcomes of the 2021 ethnographic and archaeological heritage survey.

Following close communication and engagement with the Noonkanbah and Warlangurru Traditional Owners, and following the survey's outcomes, no damage to the sites identified during the survey is expected to occur during the Proposal's activities. The proposed well site locations are deemed finalised, and the Noonkanbah and Warlangurru Traditional Owners will be invited to the well sites to monitor ground-disturbing activities when the Proposal commences. Participation of Traditional Owners and community members (Section 5.5.5.5) will be encouraged and supported.

To prevent disturbance outside cleared areas, once site preparation activities are completed, vehicles and personnel access will be limited to the well sites, main workers' camp and access tracks. With the current understanding of local heritage, the Proposal is not expected to have a significant impact on the cultural heritage of the region.

Investigations were also conducted to understand the wider social surroundings of Traditional Owners' land, including personal sense of place. The Yungngora Aboriginal Corporation and Warlangurru Aboriginal Corporation representatives felt that the proposed tracks, camps and well sites were located well away from the Yungngora Community and the Calwynyardah–Noonkanbah Road connecting the Yungngora Community to Great Northern Highway. Apart from additional vehicles and dust in remote places, it was felt by the Yungngora Aboriginal Corporation and Warlangurru Aboriginal Corporation representatives that the impacts on their aesthetic, cultural, economic and social surroundings would be minimal.

5.5.5.8 Amenity and aesthetics

The potential impacts to amenity and aesthetics directly correlate with the ability to view the Proposal's activities from the public Calwynyardah–Noonkanbah Road that crosses the permit EP 371 in a north–south direction, from Great Northern Highway to the Yungngora Community. Given the landform profiles from the public road and the vegetation types in these areas (Section 5.5.3.3), the extent to which the activities are expected to be visible is limited. Specifically, BNR believes that visual amenity impacts will be limited to a few months during the drilling activity. Once the well is drilled, activities should only be visible from the access tracks leading off from the Calwynyardah–Noonkanbah Road.

EP 371 is flat in areas, yet is characterised by undulating plains, with some mature stable dunes of moderate height and limited sand exposure. Along with the Pindan vegetation present throughout area, the landscape should limit any visual amenity impacts from the public road and pastoral tracks.

The three closest proposed well sites are at least 800 m from the Calwynyardah–Noonkanbah Road (Figure 5-59, Figure 5-60, and Figure 5-61), with most other well sites well away from the road. The drilling rig mast is expected to be around <25 m high, so it may be seen from the road or any nearby pastoral tracks for short periods of time only, and only temporarily because of the temporary duration of the drilling activity on each well site. If using a flare pit on site, no other Proposal infrastructure is expected to be seen. Based upon availability of equipment at the time of undertaking the project, a flare stack may be used. Should a flare stack be used on site, the stack and the flare itself may be seen from the road or nearby pastoral tracks. The vegetation in direct line of sight to the proposed well sites is shown in Figure 5-59, Figure 5-60, and Figure 5-61.

The visual impact of the proposed access tracks to the well sites on amenity and aesthetics are expected to be no different to the other existing pastoral and petroleum access tracks that lead off from the Calwynyardah–Noonkanbah Road. With only occasional traffic on that road (~35 vehicles per day), the remote location of any nearby receptors (at least 20 km from the nearest well site), the short duration of the Proposal activities and the nature of the landscape, impacts to amenity (if any) are expected to be limited with no long-term impacts expected. Because road usage is limited to travelling community members, pastoralists and other occasional workers from the region, and as no tourism is currently present along this area nor within the project area, tourism activities should not be affected.

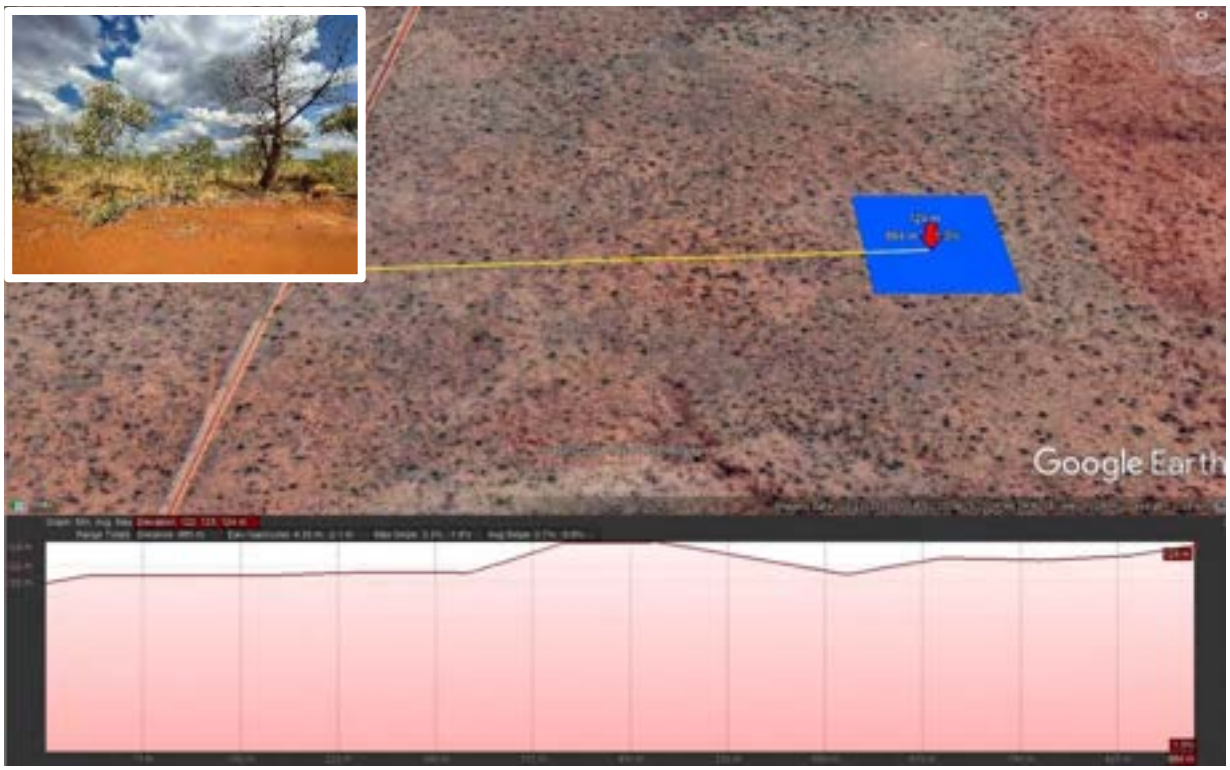

Figure 5-59: Profile – Nidavellir well site. Vegetation type – Pindan with low trees, Acacia thicket, spinifex

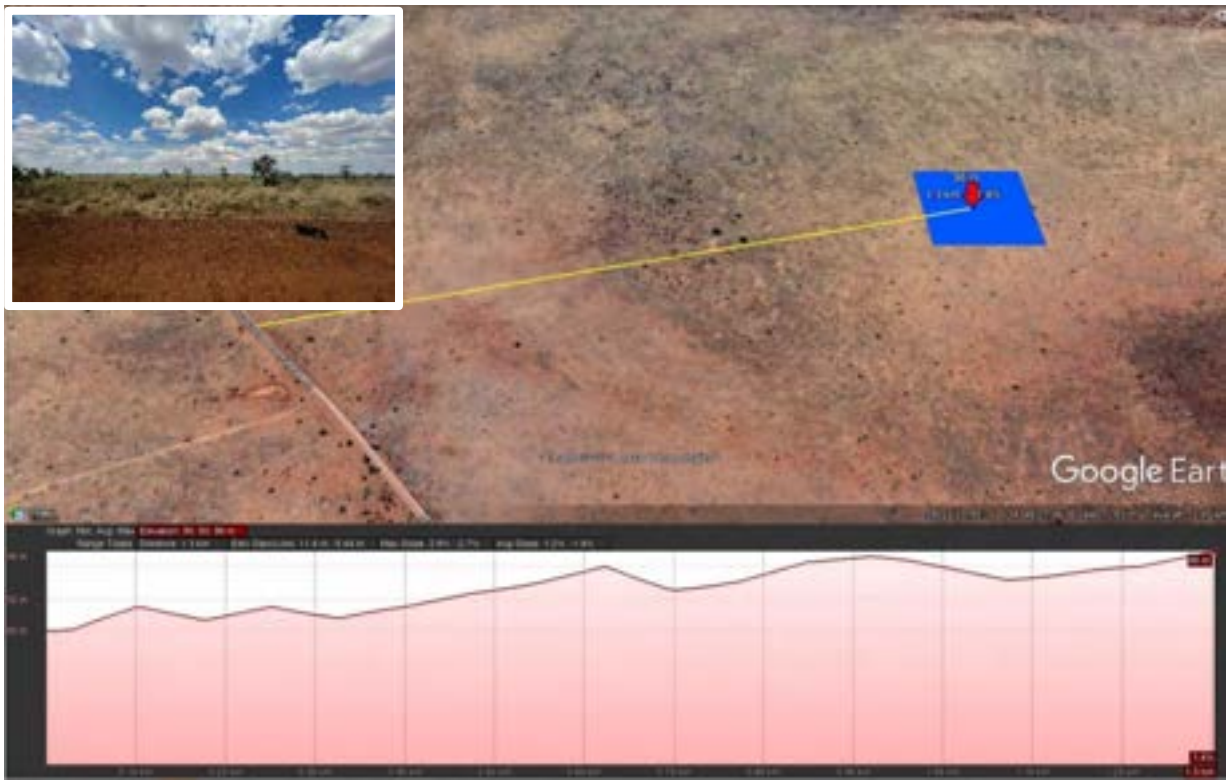

Figure 5-60: Profile – Proposed Well Site 1. Vegetation type – Pindan with low trees, Acacia thicket, spinifex

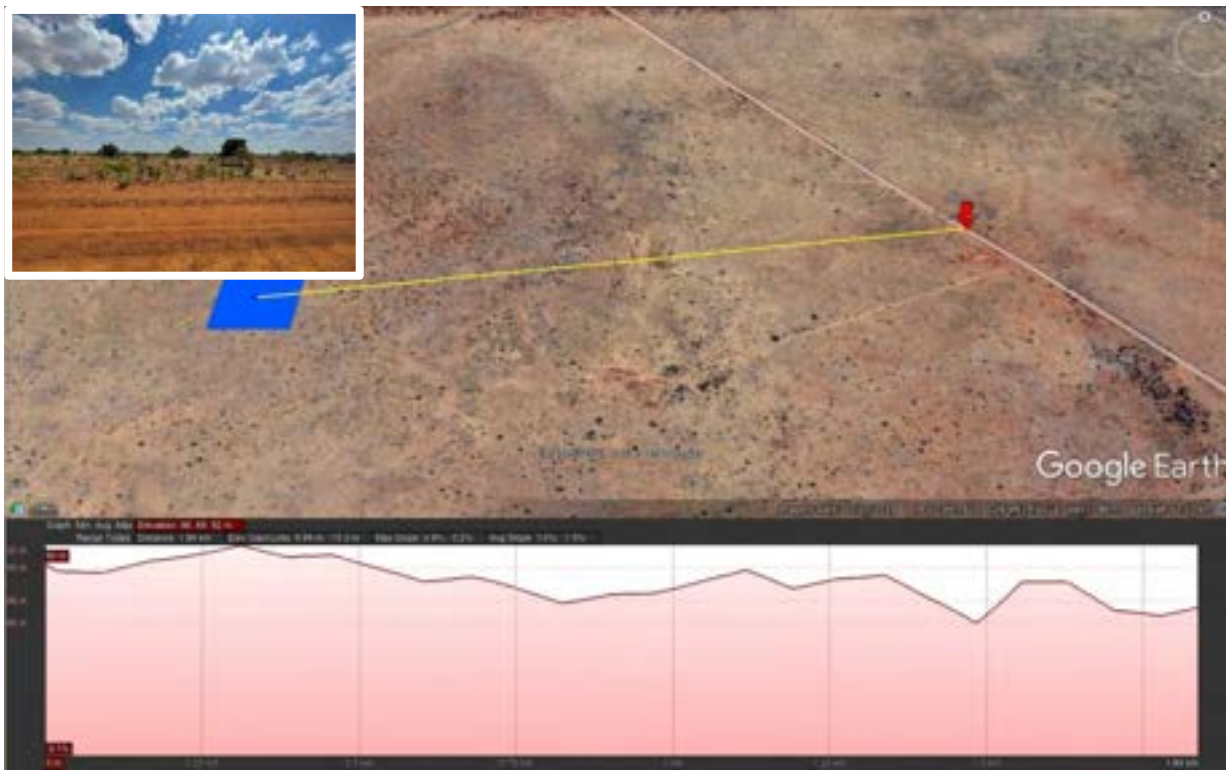

Figure 5-61: Profile – Vanaheim well site. Vegetation type – Pindan with low trees, Acacia thicket, spinifex

5.5.5.9 Local social impact arising from mental health and wellbeing

To understand the requirement from ESD Item 53, BNR reviewed the EP Act to understand how to best complete this assessment. Under the EP Act, a link to social impacts and mental health is made through emissions, specifically unreasonable emissions. An unreasonable emission is:

> *An emission or transmission of noise, odour or electromagnetic radiation which unreasonably interferes with the health, welfare, convenience, comfort or amenity of any person. (Part V, section 49)*

As the Proposal is related to an exploration activity that is short in duration, any emissions associated with the Proposal should be temporary. Specific assessments were undertaken for noise (Section 5.5.5.2), dust (Section 5.5.5.1), air emissions (Section 5.6.5.1), amenity and aesthetics (Section 5.5.5.8), and GHG emissions (Section 5.7.5). As a result of these assessments, BNR does not expect there will be any exposure from unreasonable emissions to local community members (the closest inhabited community is at least ~20 km from the proposed well sites). On this basis, exposure to any emission and credible mental health and wellbeing impacts are not expected.

5.5.6 Mitigation

Table 5-42 summarises the mitigation measures and their hierarchy relevant for the Proposal. It should be noted in particular that measures are in place to ensure there is no impact to Aboriginal heritage, as provided for under the *Aboriginal Heritage Act 1972*. As stated elsewhere, the Traditional Owners support the proposal and have engaged with BNR to identify sites of potential cultural significance. BNR has already revised the proposed disturbance footprint in response to requests from the TOs and, as shown below, TOs will be involved as heritage monitors in pre-construction surveys to ensure there will be no impact to any site of cultural significance.

An outcome of the Stakeholder engagement with TOs was acknowedgement of continued involvement once the project commences. Statements have been received from the TOs stating that “once the project commences, we will be involved with pre-construction surveys and will monitor all the ground-disturbing

activities to ensure there will be no impact to any cultural heritage sites or areas that we deem to be important for us." These statements have been provided in confidence to the EPA.

Table 5-42: Proposed mitigation measures – social surroundings

Mitigation hierarchy	Mitigation measure	Further information
Avoid	Demarcation of clearing area	Demarcation of the proposed clearing area by a surveyor reduces—to the smallest possible extent—the chance of unplanned clearing and potential damage to heritage sites outside the proposed footprint. Note, a pre-construction survey is planned to be undertaken to ensure no adverse impact to any priority flora or fauna.
Minimise	Complaints management system	BNR will record and investigate any complaints over the course of the activity and record these in the Proposal's action tracking system. This includes any complaints provided by the public regarding impacts to amenity and aesthetics.
Minimise	Visual amenity assessment during site activities	BNR will conduct an amenity and aesthetics assessment during site activities. This will comprise a visual assessment of the activity within the landscape to confirm that visual impacts, noise emissions and any other emissions do not reduce amenity at key points along the Calwynyardah–Noonkanbah Road.
Minimise	Dust management techniques	Implementing dust management techniques, such as water carts, ensures that dust generation can be prevented and reduced if necessary.
Minimise	Consultation	Consultation with relevant Traditional Owner groups will help determine the risk of heritage material being present on site. Consultation with other stakeholders will ensure that issues related to the Proposal are identified and addressed.
Minimise	Heritage monitors during disturbance of the topsoil	Traditional Owners will be invited to partake in the Proposal as heritage monitors during ground-disturbing activities. Heritage monitors will be onsite during disturbance of the topsoil to ensure that activities cease if heritage material is uncovered, and discovery of the material is immediately reported to the Noonkanbah and Warlangurru Traditional Owners to verify if it is a heritage artefact subject to protection under the *Aboriginal Heritage Act 1972* (WA).
Minimise	Inductions and cultural orientations	BNR has a comprehensive induction process that considers environmental impacts and risks. As required by ESD Item 61, BNR will provide cultural awareness and orientation to staff involved in ground-disturbance activities. BNR will conduct these in accordance with the Yungngora ILUA that specifically requires induction material to be developed in consultation with the Traditional Owners. Under the agreement, Yungngora has the right to select community members to deliver the induction package in accordance with the terms of the agreement.
Avoid	Road maintenance	No specific upgrades to the Calwynyardah–Noonkanbah Road are required for the activities. However, for the safety of other road users, BNR will monitor the condition of the gravel road throughout the Proposal's activities. BNR will liaise directly with SDWK and YAI regarding the frequency of road maintenance.
Minimise	Vehicle maintenance	To reduce emissions from traffic, BNR will monitor vehicles and maintain these, as required, throughout the Proposal.
Minimise	Decommissioning	After completing the Proposal activities, and as required under the PGER Act, BNR will submit and implement a decommissioning EP.
Rehabilitate	Progressive rehabilitation	In accordance with the PGER(E)R requirements, once drilling and HFS activities are complete, cleared areas that are not required to support the maintenance of infrastructure will be progressively rehabilitated to minimise rehabilitation legacy at the end of asset life. Topsoil and vegetation will be respread, and rehabilitation sites actively monitored to ensure they meet required completion criteria. Completion criteria will be documented in the EP.

5.5.7 Environmental outcomes

The outcomes of the Proposal are predicted to be:

- no impacts to the nearest receptors
- no impacts to heritage sites or artefacts
- no significant disruption to existing land users
- direct and indirect economic benefits to the local communities of the SDWK.

Based upon the predicted outcomes for the Proposal as shown in the information shown above, BNR does not believe that the Proposal will result in a significant impact to social surroundings. The mitigation measures intended to manage and minimise impacts on social surroundings are considered effective. Consequently, BNR believes that the EPA's objective to:

'protect social surroundings from significant harm'

can be met.

BNR has considered the WA Environmental Offsets Policy and does not believe actions to offset the predicted outcomes of the Proposal are required because the Proposal is not expected to have a significant impact on social surroundings.

5.6 Air quality

5.6.1 EPA objective

To maintain air quality and minimise emissions so that environmental values are protected.

5.6.2 Legislation, policy, and guidance

- Environmental Factor Guideline: Air Quality (EPA, 2020)
- *Environmental Protection Act 1986* (WA)
- National Environment Protection (Ambient Air Quality) Measure (NEPC, 2016)
- National Environment Protection (Air Toxics) Measure (NEPC, 2004)

5.6.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing, and procedure of the environmental review, required by Section 40(3) of the EP Act. Table 5-43 lists the ESD requirements specific to air quality.

Table 5-43: ESD checklist – air quality

Air quality		
Required work		**BNR response**
71	Undertake and provide baseline air quality monitoring for volatile organic compounds and dust for a minimum of 12 months prior to commencing the Proposal.	Section 5.6.3 Appendix H Appendix H
72	Provide a site-specific air quality risk assessment.	Section 5.6.5
73	Describe the proposed management, monitoring and mitigation methods to be implemented to address direct and indirect impact on air quality, including undertaking ongoing monitoring of dust and volatile organic compounds.	Section 5.6.6 Appendix E

5.6.3 Receiving environment

As detailed in Section 5.5.3.2, the Development Envelope is at least 18 km from any public residential area. The Nidavellir well site is ~20 km from the Jimbalakudunj Community, the Jotunheim well site is ~28 km from the Yungngora Community, and the Proposed Well Site 4 is ~55 km from Fitzroy Crossing, the nearest town.

To understand local and regional air quality within and outside the Development Envelope, a baseline air quality monitoring program was developed in consultation with DWER. Three monitoring stations were

installed (two near communities). In addition to this, an additional two sites were used to sample VOCs. To support the sampling program, two monitoring frameworks were developed and implemented being:

- baseline dust monitoring (ash content, combustible matter, total insoluble matter, and particulate matter [PM_{10}, $PM_{2.5}$])
- baseline volatile organic compounds (VOCs – BTEX) monitoring.

The three air quality sampling sites comprising dust and VOC collection points were set up at AQ_CN, AQ_S2 and AQ_CS with a meteorological station set up at AQ_S2 as shown in Figure 5-62. The meteorological station comprised a Dust Master Pro 7000 integrated with WS200-UMB Smart Weather Sensors to gather real-time meteorological data.

These sampling locations were designed to provide coverage over the Development Envelope, but also to provide baseline data in proximity to the closest sensitive receptors (the communities). This provided an understanding of existing baseline conditions, against which potential project impacts can be assessed and managed. Given the existing use of the Development Envelope (Pastoral Station) fencing was installed around the stations to prevent impacts from cattle.

The number and locations of collection points are considered representative of the Development Envelope given the remote nature of the Development Envelope, distance to industry and distance to sensitive receptors. This is consistent with the (DEC, 2011)guideline which states: *"The number and location of monitors should adequately represent community exposure and should be selected as part of a risk-based approach".* Given the remote nature of the sites, pollutant sources in the vicinity of the sites were limited to pastoral activities, periodic road activity (cars), dust and bushfire events. Siting of the stations conforms to the requirements of AS3580.1.1 as provided in Figure 5-63.

The meteorological station was set up and calibrated in accordance with manufacturer's guidelines. It was calibrated during the initial set-up and deployment in 2021, and again during its deployment in 2022. The initial set-up was completed in accordance with its manual and in consultation with ERM and Thompsons. Thompsons confirmed that set-up was appropriately calibrated via the telemetry uplink during both deployments.

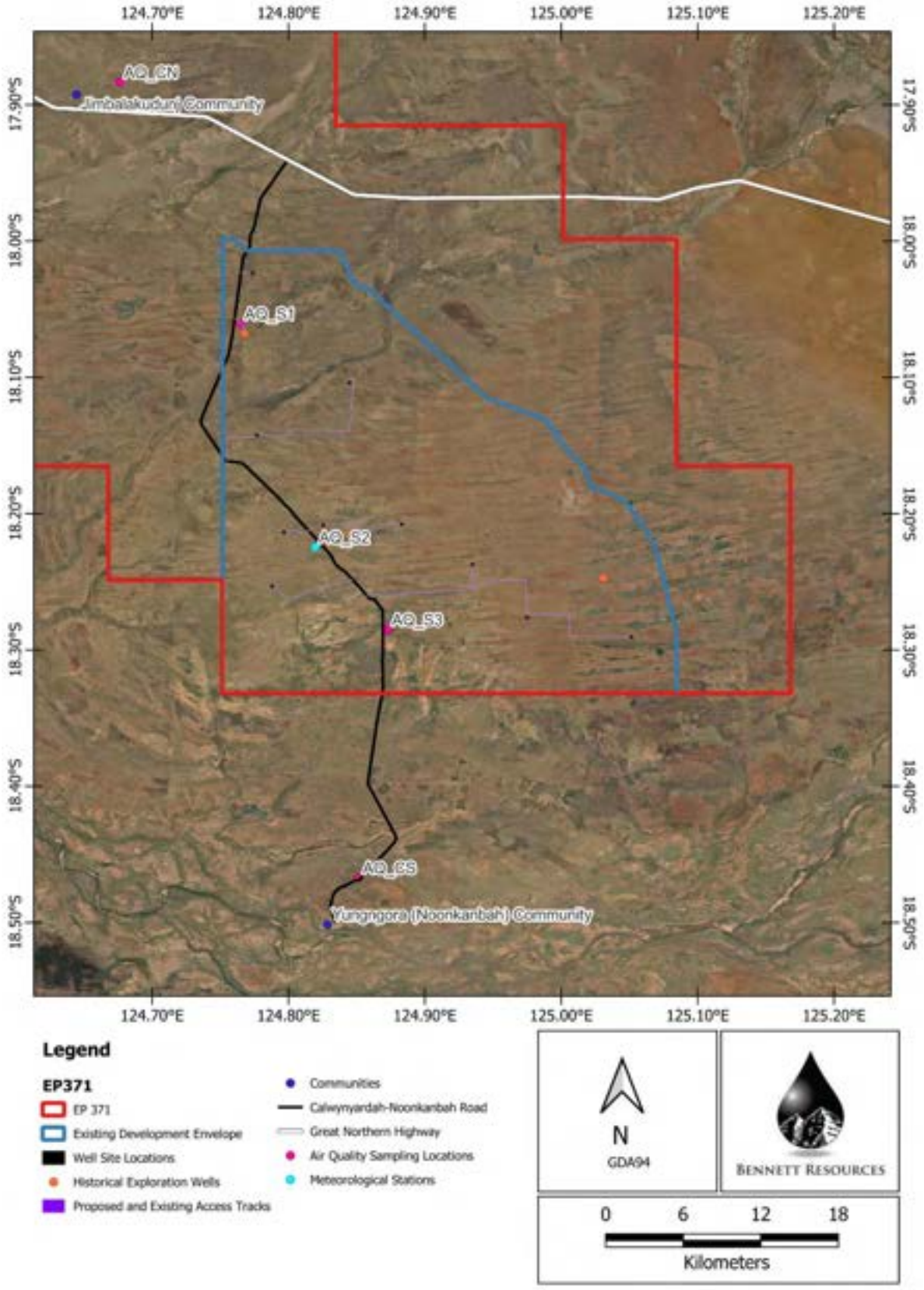

Figure 5-62: Baseline Dust and VOC Sampling Locations

Station Name	Photo of station	AS3580.1.1 – site assessment	
Station Name AQ_CN **Parameters Sampled** VOC Methane $PM_{2.5}$ PM_{10}		**GPS coordinate**	-17.8986, 124.6690
		Clear Sky angle 120°	✓
		Unrestricted air flow	✓
		>10m from road	✓
		>50m from road	✓
		10m from any object exceeding 2m	✓
		No extraneous sources nearby	✓
Station Name AQ_CS **Parameters Sampled** VOC Methane $PM_{2.5}$ PM_{10}		**GPS coordinate**	-18.4636, 124.8580
		Clear Sky angle 120°	✓
		Unrestricted air flow	✓
		>10m from road	✓
		>50m from road	✓
		10m from any object exceeding 2m	✓
		No extraneous sources nearby	✓
Station Name AQ_S2 **Parameters Sampled** VOC Methane Meteorological conditions $PM_{2.5}$ PM_{10}		**GPS coordinate**	-18.2159, 124.8056
		Clear Sky angle 120°	✓
		Unrestricted air flow	✓
		>10m from road	✓
		>50m from road	X due to the remote location, stations were set up within 50 m of roads, however these roads are not used frequently.
		10m from any object exceeding 2m	✓
		No extraneous sources nearby	✓

Figure 5-63: Overview of air quality monitoring stations

5.6.3.1 Particulate matter and dust

BNR monitored dust—comprising ash content, combustible matter, and total insoluble matter—using dust deposition gauges that have an exposure time of 30 days. BNR also used continuous light scattering instruments as part of the air quality monitoring stations that enabled particulate matter (PM_{10} and $PM_{2.5}$) data to be collected continuously throughout the monitoring period.

Given the simplicity of the dust deposition gauges, there was no requirement for calibration of the gauges. All quality assurance of laboratory samples were completed by the contractor (ALS). A sample of this data for June 2021 has been included in Appendix H.

The risk and impact of dust generation is significantly reduced during the wet season when the soil and roads are wet. Therefore, the dust monitoring period focused on the dry season months for multiple years being:

- 24 June to 21 November 2021
- 03 May 2022 to 08 November 2022.

Monitoring was primarily undertaken during the dry season, which typically lasts from May to October. For the purposes of contextualising the results of this monitoring, annual criteria were adopted as proxy criteria for comparison against the six-month averages. It must be noted that particulate matter from both wind erosion and vehicle transit on unsealed roads, and VOCs from bushfire activity are less prevalent with increased moisture in the environment. Therefore, the approach of evaluating six months of dry season data against annual averages is considered conservative.

Information from the most recent sampling year is provided below, however all available air quality data for 2021 and 2022 is included in Appendix H.

Figure 5-64, Figure 5-65, and Figure 5-66 summarise PM fluctuations over the air quality monitoring between 03 May and 08 November 2022 for the three monitoring stations. Key statistics are included for these stations in Table 5-44 and all data (presented as biannual reports) is included in Appendix H.

Table 5-44: Summary of 2022 air quality data

Period	AQ_CS	AQ_CN	AQ_S2
Start and end dates	03 May 2022 – 08 Nov 2022	02 May 2022 – 08 Nov 2022	03 May 2022 – 08 Nov 2022
Max $PM_{2.5}$	34.9	25.7	22.5
Max PM_{10}	353.2	39.5	251.1
Average $PM_{2.5}$	6.607027027	8.337234043	6.313368984
Average PM_{10}	57.49675676	15.01542553	68.87219251
Exceedance $PM_{2.5}$	6	1	0
Exceedance PM_{10}	71	0	103
Data Availability [16](%)	97%	98%	98%

For indicative purposes the period average from May to November was compared to annual average criteria of 25 µg/m^3 and 8 µg/m^3 for PM_{10} and $PM_{2.5}$, respectively. There were exceedances of the annual average PM_{10} criteria at location 397 (AQ_CS) and location 399 (AQ_S2). There were exceedances of the annual average $PM_{2.5}$ criteria at location 397 (AQ_CS). Given that particulate matter concentrations are anticipated to be lower during the wet season, this result is not necessarily indicative of an exceedance of the annual average criterion.

[16] *Based upon number of days where no reading was provided [NA in the data].*

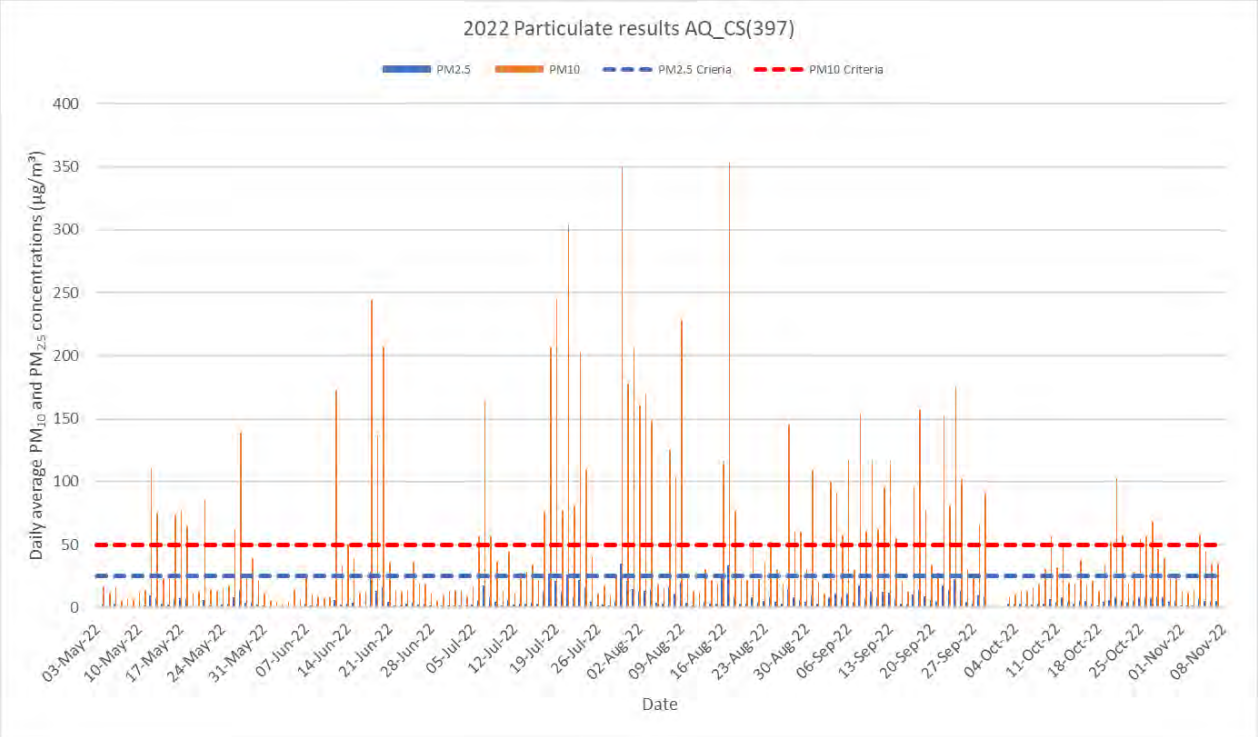

Figure 5-64: Daily average PM_{10} and $PM_{2.5}$ concentrations at location 397 (AQ_CS) from May 2022 to November 2022

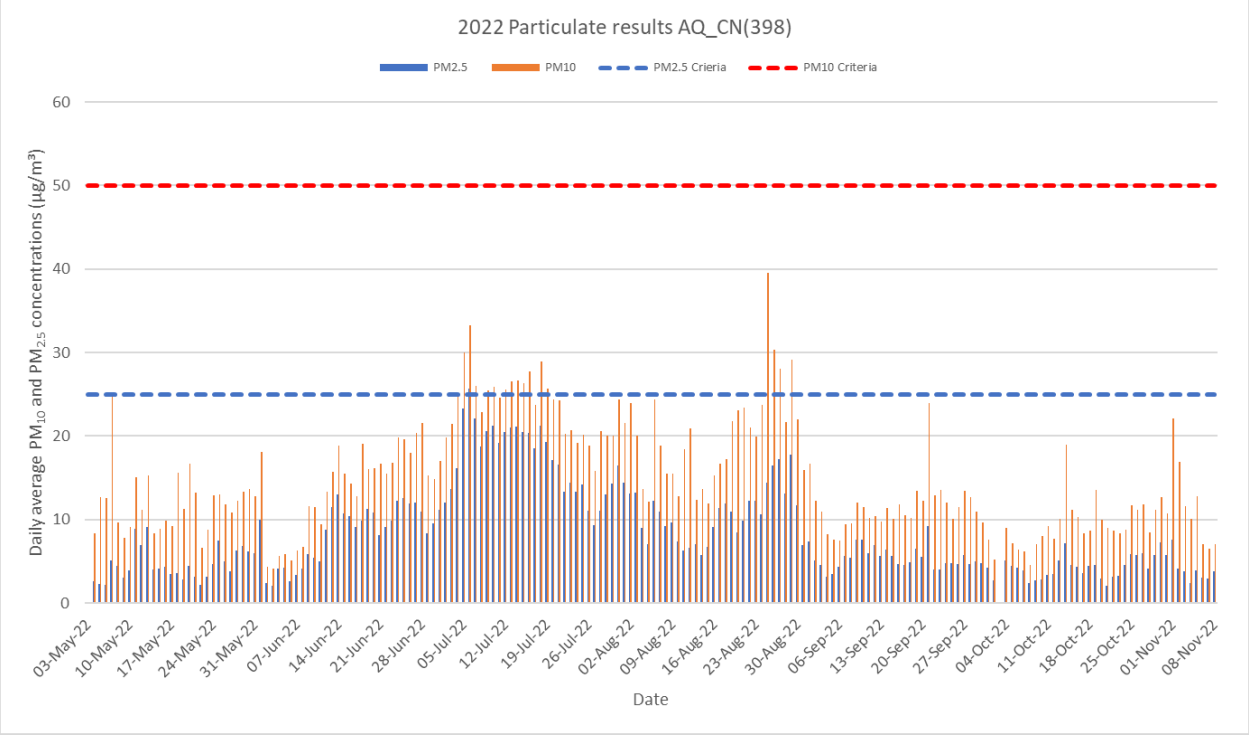

Figure 5-65: Daily average PM_{10} and $PM_{2.5}$ concentrations at location 398 (AQ_CN) from May 2022 to November 2022

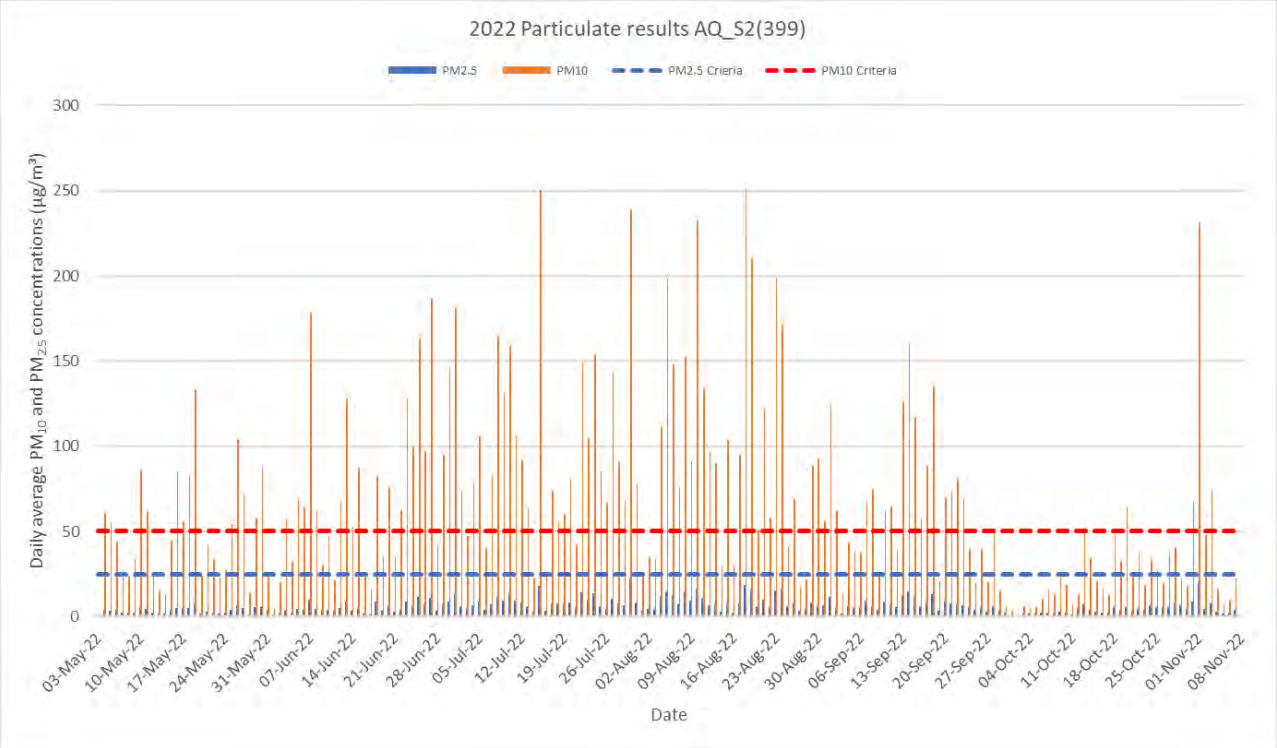

Figure 5-66: Daily average PM_{10} and $PM_{2.5}$ concentrations at location 399 (AQ_S2) from May 2022 to November 2022.

5.6.3.2 Volatile organic compounds

BNR monitored ambient VOCs using an evacuated canister method. Evacuated canisters are typically configured to provide measurements from a maximum 24-hour exposure, but the analysis suite can be broad and down to parts per billion resolution. The sampling method involves the collection of samples into passivated evacuated canisters, with canister preparation and post-sampling analysis undertaken by a third party laboratory that is NATA accredited for the USEPA TO-15 methodology, as specified within Compendium Method TO-15 - Determination of volatile organic compounds in air collected in specially-prepared canisters and analysed by gas chromatography / mass spectrometry US EPA, 1999).

Due to the batch nature of the method, for this baseline program canisters were deployed on a monthly basis to provide robust context on ambient VOC levels given the absence of identified sources of VOCs.

Although other methods were considered (such as radiello tubes for a 2-4 week period at a time), given the likelihood of them being impacted by heat and humidity this sampling method was not considered further. The gas cannisters were set up in the same location each month. Given the time limits associated with their deployment, journey management plans for the monitoring program were implemented to ensure that they were left in the field for precisely 24 hours. Once secured in place at the location, the cannisters were opened, allowing the inert gas to be displaced with the air sample collected. The canisters were then closed, collected, transported back to Perth and transported to the laboratory consistent with the requirement USEPA TO-15 methodology.

Given the nature of this sampling methodology limited QA/QC is required given the cannisters are swapped over at a laboratory. Prior to receiving the canisters, the laboratory cleans and certifies them. This ensure that the canisters are free of residual contamination prior to sample collection. The flow regulator is also calibrated at the laboratory before release. All laboratory calibration is available by the contractor (ALS). A sample of this data for June 2021 has been included into Appendix H.

The sampling program verified that VOCs across the sampling locations were low, with all samples returning results that were below the laboratory LoR thresholds. Because industrial activities are very limited in the area, the results correspond with what was expected before implementing the baseline monitoring program.

The results of the VOC monitoring were screened against Australian and US criteria that are nominated for use in the evaluation of ambient monitoring data, for identification of whether additional investigation is required. There were no positive detections present for any VOCs, and all results were significantly lower than respective screening criteria.

Table 5-43 lists VOC/BTEX baseline sampling data, aggregated for all locations, for the period June-November 2021 at the three monitoring locations, with the baseline monthly report provided in Appendix H. There were no positive detections above the laboratory's LoR. A comparison of the data against the health and amenity criteria (DWER, 2019; EPA NSW, 2016; WHO, 2010) presented in the Valhalla Monitoring Plan (Appendix E) confirmed that the monitored concentrations were all under the criteria values.

Table 5-45: Summary of reported VOC concentrations – June to November 2021

	Reported concentration (all locations) µg/m³ – June–July 2021			
Month	**Benene**	**Toluene**	**Ethylbenzene**	**Xylenes**
June	<1.6	<1.9	<2.2	<6.5
July	<1.6	<1.9	<2.2	<6.5
August	<1.6	<1.9	<2.2	<6.5
September	<1.6	<1.9	<2.2	<6.5
October	<1.6	<1.9	<2.2	<6.5
November	<1.6	<1.9	<2.2	<6.5

Note: "<" less than Limit of Reporting (LOR).

5.6.4 Potential impacts

The potential impacts associated with this environmental factor are limited to:

- reduction in air quality causing impacts to sensitive social receptors
- increased dust generation resulting in deposition impacts to flora and vegetation.

5.6.5 Assessment of impacts

5.6.5.1 Reduction in air quality causing impacts to sensitive social receptors

Operating diesel-powered vehicles and heavy equipment and generating power during all phases of the Proposal will generate combustion emissions, including nitrogen oxides (NO_X), SO_2, PM_{10}, and VOCs. However, these emissions are expected to disperse rapidly upon release. This is due to the fact that the Proposal footprint is small, drilling will be undertaken for a short duration only and the amount of equipment on site will be very small.

Emissions associated with well testing (or flaring) are likely to also occur from Proposal activities. However, flaring emissions are known to disperse rapidly as they rise through the atmosphere, therefore exposure to sensitive receptors is not expected. Similar activities occur around the state, and flaring dispersion modelling conducted for much larger projects show ground-level concentrations in isolation and cumulatively are well below the corresponding ambient air quality and workplace exposure standard criteria (Ramboll, 2019).

The storage and onsite use of proppant along with general traffic on dirt roads will generate dust emissions. Dust emissions associated with the types of vehicles, machinery and equipment operating on unsealed surfaces are not expected to be significantly different from other sources in the region. Proppant storage and handling will only occur on the well sites. Dust can cause reduced air quality, acute and chronic health effects and amenity impacts (it reduces visibility and settles on surfaces, causing soiling and staining) (DEC, 2011). Using a dust risk assessment tool (DEC, 2011), which considered the soil type, wind speeds and location context, the risks associated with dust caused by the activities associated with the Proposal were classed as negligible (Table 5-39), with no provisions or contingency arrangements required.

To further understand the potential exposure pathways to the public, BNR completed a Public Health Risk Assessment (Appendix N). The nearest fixed receptors (Section 5.5.3.2) are at least 20 km from the well sites. Non-fixed receptors such as travelling Traditional Owners and station workers may also be

encountered near the well sites. Based on these distances and the surrounding rural land use, air emissions arising from using vehicles, heavy equipment and generators are not considered to represent a significant or long-lasting impact to air quality, human health, or aesthetics during site activities.

5.6.5.2 Increased dust generation resulting in deposition impacts to flora and vegetation

A five-year monitoring program that investigated impacts of dust on vegetation from a significant development in the Pilbara, where significantly higher volumes of vehicles (heavy and light) and earthworks were present, determined that no adverse impacts occurred to plant health or vegetation communities as a result of construction dust loads (Chevron Australia, 2015).

Because the dominant vegetation type within the Development Envelope is the same as that associated with the long-term monitoring program conducted in the Pilbara, BNR does not believe that dust deposition poses a significant impact to flora or vegetation. Impacts from dust on vegetation is also discussed in the flora and vegetation environmental factor in Section 5.1.5.4.

5.6.6 Mitigation

Table 5-46 summarises the mitigation measures and their hierarchy. Additionally, BNR will implement an air quality monitoring program (Appendix E). The program includes additional baseline and surveillance data collection, details the list of analytes to be collected, and the trigger and threshold contingency actions to be implemented during surveillance monitoring at each well site.

Table 5-46: Proposed mitigation measures – air quality

Mitigation hierarchy	Mitigation measure	Further information
Avoid	Green completions	BNR is considering using green completions, which allow gas produced during well completions to be separated for offtake to a sales gas pipeline. Given the distance of the well sites to existing gas markets, the emissions associated with transport offsite will also need to be considered. Because of the complexities of negotiating an offtake agreement with a gas supplier, the green completions option will be considered closer to the time of the activity.
Minimise	Monitoring program	Throughout the planning phase, BNR has conducted baseline air quality monitoring in accordance with EPA guidance and in consultation with DWER. Although the initial program formed the basis of this assessment, BNR plans to continue with a range of both baseline and surveillance monitoring programs to verify the Proposal activities can be undertaken in a way that has no significant impacts to the environment. A summary of the proposed air quality monitoring program to be undertaken for the Proposal is included in Appendix E. Specifically, the air quality monitoring planned for the Proposal includes: • continuing ambient air quality monitoring • verifying that ambient air quality levels near the communities (~2.5 to 5 km away) remain unaffected by the activity.
Minimise	Use of pilot flame during flaring, thereby minimising cold venting of methane	BNR will reduce cold venting during well test flaring to ALARP, which will significantly reduce methane emissions associated with this activity. Cold venting results in the release of methane, carbon dioxide, VOCs, sulphur compounds and gas impurities to the atmosphere, whereas flaring causes these gases to oxidise and form carbon dioxide, which has a global warming potential 25 times lower than methane.
Minimise	Dust management techniques	BNR will implement dust management techniques, such as dust suppression, to ensure that dust generation is minimised.
Minimise	Complaints management system	BNR will record and investigate any atmospheric emission complaints over the course of the activity and record these in the Proposal's action tracking system.

5.6.7 Environmental outcomes

The outcome of the Proposal is predicted to be no reduction in air quality that results in impacts to sensitive social receptors.

Based on the predicted outcomes for the Proposal as shown in the information above, BNR does not believe that the Proposal will result in a significant impact to air quality. The environmental mitigation measures

intended to manage and minimise impacts on air quality are considered effective. Consequently, BNR believes that the EPA's objective to:

'maintain air quality and minimise emissions so that environmental values are protected'

can be met.

BNR has considered the WA Environmental Offsets Policy and does not believe actions to offset the predicted outcomes of the Proposal are required because the Proposal is not expected to have a significant impact on air quality.

5.7 Greenhouse gas emissions

5.7.1 EPA objective

To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.

5.7.2 Legislation, policy, and guidance

- Environmental Factor Guideline Greenhouse Gas Emissions (EPA, 2020)
- Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2023)
- United Nations Framework Convention on Climate Change (UNFCCC) Reporting Guidelines on Annual Inventories (UNFCCC, 2014)
- *Environmental Protection Act 1986* (WA) (EP Act)
- *National Greenhouse and Energy Reporting Act 2007* (NGER Act) (Commonwealth).

The National Greenhouse and Energy Reporting (NGER) legislative regime establishes a single national reporting framework for energy and emissions reporting and managing emissions. The NGER regime also contains the safeguard mechanism that applies to 'designated large facilities' with emissions >100,000 tCO_2-e in a financial year, as defined in Section 22XJ of the NGER Act.

The Proposal is for a temporary exploration activity at several well locations; no well site meets the threshold of a 'designated large facility'. This exploration stage will further appraise the economic viability for future development—subsequent development and operation of any future processing facilities may constitute a designated large facility under the NGER Act.

5.7.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing and procedure of the environmental review, required by Section 40(3) of the EP Act. Table 5-47 lists the ESD requirements specific to GHG emissions.

Table 5-47: ESD checklist – greenhouse gas emissions

Greenhouse gas emissions		
Required work		**BNR response**
74	Provide credible estimates of scope 1, scope 2 and scope 3 greenhouse gas emissions (annual and total) in tonnes of carbon dioxide equivalent (CO_2-e) over the life of the Proposal. Detail methods used to estimate emissions.	Section 5.7.5.1 Appendix R
75	Provide a breakdown of estimated scope 1 and scope 2 greenhouse gas emissions in tonnes of CO_2-e by all sources. Consider all proposed activities in determining the sources of emissions (e.g. clearing of land, site preparations, drilling operations, hydraulic fracture stimulation operations including flaring, potential leakage etc.).	Section 5.7.5.1
76	Provide calculations and calculation methodology for determining estimated emissions of CO_2-e for all sources.	Section 5.7.5.1 Appendix R
77	Benchmark the Proposal's emissions against other hydraulic fracture stimulation exploration projects. Information which supports that the identified projects are comparable to the Proposal should be included.	Section 5.7.5.1

Greenhouse gas emissions		
Required work		**BNR response**
78	Provide a greenhouse gas management plan, in accordance with EPA guidance, which demonstrates the Proposal's trajectory towards net zero emissions by 2050. The plan should include at a minimum: a. information required by 74 to 77 above b. a graph and table showing regular targets reflecting an incremental reduction in emissions towards net zero emissions by 2050. Where the proposed emissions reduction targets do not demonstrate a trajectory towards net zero by 2050, articulate clearly a compelling reason why it is not possible to achieve this c. mitigation (avoidance, reduction, offset) measures to be implemented with associated timeframes and evidence to demonstrate that the interim and long-term targets will be met. Where it is proposed that, following implementation of the avoidance and reduction measures, authorised offsets will be applied to meet the targets, evidence which supports that the mitigation measures are capable of achieving the stated targets is still required d. analysis of other potential abatement measures (e.g. renewables) relevant to the Proposal that are not proposed to be implemented which provides the rationale to support that these measures are unable to be implemented e. reporting requirements for publicly and periodically reporting against the stated targets.	Appendix R
79	Undertake and provide baseline measurements and monitoring for greenhouse gases, for a minimum of 12 months prior to any regulated activities.	Section 5.7.3
80	Provide a monitoring and reporting program measuring atmospheric concentrations and process leakage of methane over every well's entire life cycle, with recognition that any detected leaks must be fixed by the operator.	Appendix E Appendix R

5.7.3 Receiving environment

Six categories of GHG are covered by the United Nations Framework Convention on Climate Change (UNFCCC) Reporting Guidelines on Annual Inventories (UNFCCC, 2014). These gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the synthetic GHGs—sulphur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perfluorocarbons (PFC). In discussions with DWER, BNR identified that targeted monitoring of CH_4 would provide an indication of ambient GHG emissions within the Development Envelope.

Consequently, a methane monitoring program was developed to understand ambient methane levels in the project area. BNR conducted monthly samples at three separate locations using an evacuated canister method. The canisters provide measurements from a maximum 24-hour exposure. Passivated evacuated canisters were used to collect the samples and analysis was undertaken by a NATA-accredited laboratory using the EP104 light hydrocarbon (calculated concentration) method.

Table 5-48 and Appendix H summarises the ambient methane emissions recorded at three monitoring locations between June–November 2021.

Table 5-48: Summary of methane monitoring results

	Sampling location			
Date	**Laboratory LoR**	**AQ_S1 (mg/m³)**	**AQ_S2 (mg/m³)**	**AQ_S3 (mg/m³)**
24 June 2021	3.3 mg/m³	<6.60	<6.60	<6.60
22 July 2021		<6.60	<6.60	<6.60
18 August 2021		<6.60	<6.60	<6.60
21 September 2021		<6.60	<6.60	<6.60
21 October 2021		<6.60	<6.60	<6.60
16 November 2021		<6.60	<6.60	<6.60

5.7.4 Potential impacts

Due to the nature of the Proposal, emissions mainly occur at the onset of activities; exploration emissions are likely very small when distributed over the general producing life of an asset.

The potential impacts associated with this environmental factor are limited to:

- contribution to GHG emissions.

5.7.5 Assessment of impacts

- Greenhouse gas emissions estimations

Table 5-49 lists the inventory of direct scope 1[17] GHG emissions. The methods used to calculate this inventory are detailed in Appendix R. As detailed in Appendix R, the sources of scope 1 GHG emissions (per well) are:

- gas flaring, comprising ~85.2% of scope 1 GHG emissions
- condensate flaring, comprising ~7.9% of scope 1 GHG emissions
- diesel fuel usage, comprising ~6.3% of scope 1 GHG emissions
- land clearing and fugitive emissions, comprising ~0.6% of scope 1 GHG emissions.

Table 5-49: Scope 1 GHG inventory

CO_2 emissions per exploration and appraisal well	Input parameter	Phase I – 6 wells (tCO_2-e)		Phase II – 14 wells (tCO_2-e)		Calculation reference
		~60 days flaring	~90[18] days flaring	~60 days flaring	~90 days flaring	
Land clearing (per well)						
Land clearing emissions	5.1 ha per well 56.3 tCO_2-e/ha	287	287	287	287	FullCAM Model (Australian Government, 2020)
Diesel emissions (per well)						
Site preparation	20	54	54	54	54	NGER Guidelines (Government of Australia, 2008) Section 2.41 with Table in Schedule 1 Part 3.
Drilling activities	316	857	857	857	857	
HFS activities	510	1,382	1,382	1,382	1,382	
Site reinstatement	20	54	54	54	54	
Transport (vehicles/rigs)	344	931	931	931	931	
Site power	8	15	22	15	22	
Flare (per well)						
Gas	Phase I: 5.9 mmscf/d Phase II: 10.7 mmscf/d	29,747	44,620	53,948	80,921	NGER Guidelines (Government of Australia, 2008) Section 3.44
Condensate	Phase I: 118 bbl/d Phase II: 214 bbl/d	2,760	4,140	5,005	7,507	NGER Guidelines (Government of Australia, 2008) Section 3.52

[17] Scope 1 GHG emissions: emissions released to the atmosphere as a direct result of an activity (direct emissions), or series of activities at a facility level.

Scope 2 GHG emissions: emissions released to the atmosphere from the indirect consumption of an energy commodity (indirect emissions).

Scope 3 GHG emissions: indirect GHG emissions other than scope 2 emissions that are generated in the wider economy.

[18] BNR has estimated that to collect the required data, the well must be flowed during the period of maximum gas concentration for up to 90 days.

CO_2 emissions per exploration and appraisal well	Input parameter	Phase I – 6 wells (tCO_2-e)		Phase II – 14 wells (tCO_2-e)		Calculation reference
		~60 days flaring	~90[18] days flaring	~60 days flaring	~90 days flaring	
Fugitive emissions (per well)						
Drill cuttings	Gas 0.12 tonnes	30	30	30	30	Based on volumes of drill cuttings and Valhalla gas saturation
Wastewater	2 ML produced formation water	20	20	20	20	API GHG Emissions Methodologies for Oil and Gas (API, 2009)
Total GHG emissions per well (tCO_2-e)		**36,136**	**52,936**	**62,582**	**92,065**	**Scope 1 (direct emissions)**
Total emissions exploration and appraisal program (tCO_2-e)	Phase I–6 wells Phase II–14 wells	216,814	314,378	876,144	1,288,915	Scope 1 (direct emissions)

As the Proposal does not intend to import power from third parties, no Scope 2 emissions are expected.

Although no Scope 3 emissions are expected, BNR may sell condensate collected during the well test program to third parties (if feasible) as a recommended GHG mitigation measure. By implementing this mitigation, BNR would avoid emissions associated with condensate flaring. The quantity of Scope 3 emissions associated with transporting and using condensate as a fuel was calculated on the basis that all condensate produced from a 90-day flaring period was captured and transported via Wyndham to Singapore where it was assumed to be processed and consumed. Table 5-50 lists the Scope 3 GHG emissions inventory.

Table 5-50: Scope 3 GHG emissions inventory

Scope 3 Emissions per well	~60 days flaring	~90 days flaring
Condensate volume (bbl)	222,240	333,360
Condensate transport emissions (tCO_2-e)	13,952	20,928
Condensate consumption emissions (tCO_2-e)	91,571	137,356
Total Scope 3 emissions (tCO_2-e)	**105,523**	**158,284**

5.7.5.1 Greenhouse gas emissions benchmarking

As required under ESD Item 77, BNR completed an emissions benchmarking assessment to understand how the Proposal compares to other HFS projects. Specifically, BNR benchmarked the Proposal emissions against these projects (company name – location – project name):

- Buru – Canning Basin – TGS14 Project
- Origin – Beetaloo Basin – Velkerri Project
- Origin – Beetaloo Basin – Kyalla Project
- Santos – McArthur Basin – EP161 Project
- Imperial – McArthur Basin – Carpenteria 1.

To benchmark projects for their GHG emissions, GHG emissions intensity values are typically calculated on a 'tCO_2-e per tonne of product' basis (for manufacturing projects) or 'tCO_2-e per kWh' basis (for power generation projects) so that project emissions can be compared. GHG emission intensities from gas exploration projects cannot be compared using either basis. Therefore, other methods were used to benchmark the Proposal.

GHG emissions intensities on a 'per Well per Test Day' basis for the Proposal are shown in Figure 5-67. The results indicate more emissions from the Valhalla per day rate are expected due to its higher flow rates per day. Note: The Origin and Santos test programs are planned for a significantly longer period (up to 3–12 months) compared to two to three months for the Proposal. Therefore, another comparison was made

based on flaring duration to understand total emissions per well from these exploration and appraisal programs. Figure 5-68 shows planned total emissions per well. The results indicate that wells associated with Phase I of the Proposal are comparable with the permitted/planned total emissions of other projects in the Beetaloo Basin in the Northern Territory. Phase II wells from this Proposal are higher than the other projects due to their potentially higher flow test rates.

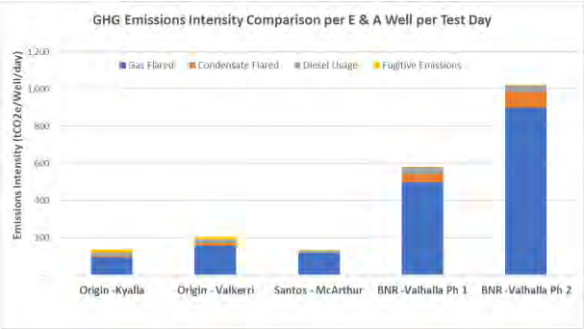

Figure 5-67: Benchmarking GHG emissions of the Valhalla program per well per test day

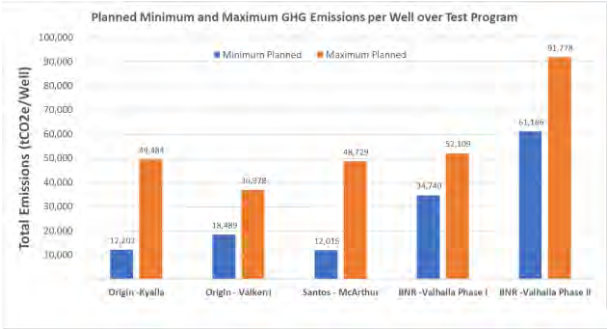

Figure 5-68: Benchmarking GHG emissions of the Valhalla program for planned total emissions per well

5.7.6 Mitigation

The Proposal is an exploration stage activity; therefore, BNR intends to flare (not vent) produced gas during well testing because flaring converts methane to CO_2 and water, thus significantly reducing methane emissions. Carbon dioxide has a global warming potential 25 times lower than methane over a 100-year span—removing methane is preferable. This is a standard industry approach, and when combined with the correct flaring technology, is an economically and environmentally sound approach for managing these types of emissions during an exploration program. Flaring during early-stage exploration is aligned with Recommendation 12 of the HFS Scientific Inquiry (Independent Scientific Panel Inquiry, 2018).

The nature of the Proposal (i.e. an exploration and appraisal program only) and the lack of available infrastructure, means that options for capturing and reinjecting CO_2 are not feasible. Carbon capture or reinjection requires wells that are suitable for injection, dedicated treatment facilities to treat and compress the gas, and a transport network of pipelines. A Part IV Greenhouse Gas Environmental Management Plan (GHG EMP) (Appendix R) has been prepared for submission with this ERD. The purpose of the GHG EMP is to develop management measures that minimise impacts associated with implementing this Proposal. The GHG EMP will be implemented to demonstrate that residual GHG impacts from the Proposal are not greater than predicted.

Table 5-51: Proposed mitigation measures – greenhouse gas emissions

Mitigation hierarchy	Mitigation measure	Further information
Reduce	Monitoring program	Throughout the planning phase, BNR has conducted baseline GHG emissions monitoring (limited to methane) in accordance with EPA guidance and in consultation with DWER. Although the initial program formed the basis of this assessment, BNR plan to continue its methane monitoring program with baseline and surveillance monitoring to verify the impacts of the Proposal's activities. Monitoring will continue until a trend *back to baseline levels has been demonstrated **and** at least two consecutive results reflect no significant deviation from ambient (baseline) samples* (Appendix E).
Avoid/Reduce	Valhalla GHGEMP	As required by the ESD Item 78, BNR has developed a GHGEMP that documents the mitigation and management measures associated with the Proposal. A summary of the proposed GHG monitoring to be undertaken in accordance with the GHGEMP is provided in Appendix R.
Minimise	NGER reporting	BNR will maintain emissions records to enable GHG emissions reporting as required under the NGER Act.

5.7.7 Environmental outcome

The outcome of the Proposal is predicted to be:

- GHG emissions minimised to ALARP to mitigate the risk of environmental harm associated with climate change.

Based on the predicted outcome for the Proposal, BNR does not believe that the Proposal will result in a significant contribution to GHG emissions. The environmental mitigation measures intended to manage and minimise impacts to GHG emissions are considered effective. Gas and thus associated emissions from the Proposal will enable BNR to gain a better understanding of the existing geology, and better identify mitigation measures that may be implemented during future field development. It should be noted that this program is an exploration and appraisal activity, thus assessment of GHG emissions from future development is outside the scope of the proposal.

5.8 Human health

5.8.1 EPA objective

To protect human health from significant harm.

5.8.2 Policy and guidance

- Environmental Factor Guideline Human Health (EPA, 2016k)

5.8.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing, and procedure of the environmental review, required by Section 40(3) of the EP Act. Table 5-52 lists the ESD requirements specific to human health.

Table 5-52: ESD checklist – human health

Human health		
Required work		**BNR response**
81	Conduct a desktop assessment of the radionuclides and metals likely to be present in the geology of the Proposal area based on an interpretation of the site geology, exploration drilling data previously collected, and publicly available geophysical mapping. The assessment should explain if naturally occurring radionuclides and metals are likely to be of environmental significance or detrimental to human health during the development of the project and throughout operations.	Section 5.8.3
82	Conduct an assessment of potential impacts to human health.	Section 5.8.5.1
83	Outline the outcomes/objectives, management, monitoring, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted.	Appendix E
84	Provide information on wastewater management on site.	Section 5.8.6 Section 2.6
85	Discuss the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the Proposal has addressed the mitigation hierarchy in relation to impacts on human health.	Section 5.8.6 Appendix E
86	Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.	Section 5.8.7

5.8.3 Receiving environment

Generally, geological formations that contain oil and gas deposits also contain naturally occurring radionuclides (referred to as NORMs). These include uranium, thorium, and potassium, which can produce a range of other elements known as decay products such as radon and radium. NORMs are found everywhere in the environment including soil, rocks, water, air, and vegetation. They are also present in the human body and all living tissues, typically in very low concentrations (South Australian EPA, 2017). Table 5-53 lists the properties of radionuclides.

Table 5-53: Properties of radionuclide members of the ^{238}U and ^{232}Th decay chains (ARPANSA, 2008)

Radionuclide	Half-life (Chu & Ekström, 1999)	Principal radiation (α, β or γ)
^{238}U decay chain		
Uranium-238	4.468×10^9 years	α
Radium-226	1.6×10^3 years	α
Lead-210	22.3 years	β, γ
^{232}Th decay chain		
Thorium-232	1.41×10^{10} years	α, β, γ
Radium-228	5.75 years	β
Thorium-228	1.91 years	α

Although the ESD requests that BNR conduct a desktop assessment of the radionuclides and metals likely to be present in the geology of the Proposal area based on an interpretation of the site geology, BNR already has field data from the previous operator, which removes the uncertainty of relying on a simple desktop assessment and associated data. In 2015, the previous operator analysed formation water produced during well testing from the previous HFS program. Individual samples were taken before they were stored in the water retention ponds as well as samples from within water retention ponds to characterise the entire produced formation water volume. Table 5-54 and Table 5-55 list the results of this program. The Australian drinking water quality guidance level is 0.5 Bq/L for gross alpha (α) and 0.5 Bq/L for gross beta (β) (excluding potassium-40 activity) (NHMRC and NRMMC, 2011 (updated March 2021)). Additionally, the drinking water guidelines present a health guideline of 0.017 mg/L for uranium in water (NHMRC and NRMMC, 2011 (updated March 2021)).

These samples indicate that although water produced from the Laurel Formation did contain NORMs, the concentrations were well below the exposure concentrations as identified by the Australian and New Zealand guidelines for fresh and marine water quality (ANZECC and ARMCANZ, 2018) for stock and irrigation land uses.

Table 5-54: Produced Laurel Formation water characterisation (metals and chloride)

Analyte	Onsite management levels (mg/L)	Asgard 1 pond post-well test	Valhalla North 1 pond post-well test
		Sep 2015–Oct 2015	Sep 2015–Oct 2015
Arsenic	0.5*	<0.02	<0.02
Barium	2#	20	12
Boron	4#	9.4	14
Cadmium	0.002#	<0.002	<0.002
Chloride	30,000	16,000	17,000
Chromium VI	0.05#	<0.02	<0.02
Copper	1*	<0.02	<0.02
Lead	0.1*	<0.02	<0.02
Manganese	0.5#	0.15	0.51
Mercury	0.002*	<0.0001	<0.0001
Nickel	1*	<0.02	<0.02
Selenium	0.01#	<0.02	<0.02
Zinc	20*	<0.1	<0.1

Notes –

** – Stock water: Australian and New Zealand guidelines for fresh and marine water quality* (ANZECC and ARMCANZ, 2018)

 # – Health values: Australian Drinking Water Guidelines 6, Version 3.5 (NHMRC and NRMMC, 2011 (updated March 2021))

Table 5-55: Produced Laurel Formation water characterisation (radioisotopes)

Sample Number	Date	Unit	Radionuclides					
			Uranium Series			Thorium Series		
			Uranium-238	Radium-226	Lead-210	Thorium-232	Radium-228	Thorium-228
Asgard 1 produced formation water retention pond	25 Feb 2016	Bq/L	0.01 ±0.01	1.113 ±0.093	<0.22	<0.005	1.35 ±0.12	<0.034
Valhalla North 1 produced formation water retention pond	28 Jan 2016	Bq/L	<0.02	1.046 ±0.085	<0.14	<0.005	1.32 ±0.11	<0.025

5.8.4 Potential impacts

The potential impact associated with this environmental factor is limited to:

- industrial processes that result in the build-up and release of radioactive substances or emissions.

5.8.5 Assessment of impacts

5.8.5.1 Industrial processes that result in the build-up and release of radioactive substances or emissions

During gas extraction processes, NORMs may be brought to the surface, resulting in the potential for human exposure. As the Proposal is a short-term exploration and appraisal program, occupational exposure to radiation is very limited. The potential for human exposure to NORMs will be limited to produced formation water storage within the water retention pond (Figure 2-4) and drill cuttings and fluids within the drilling sump. Public exposure to produced formation water or drill cuttings is considerent non-existent under normal operating conditions, and human exposure (workers) to the drill cuttings and water retention pond is also limited because they are closed-loop systems (Figure 2-4).

Monitoring of Laurel Formation water produced during well testing indicates that, on average, NORM levels for samples from the water retention pond are low and well below the Australian and New Zealand guidelines for fresh and marine water quality (ANZECC and ARMCANZ, 2018) and the Australian drinking water guideline levels (NHMRC and NRMMC, 2011 (updated March 2021)) (Table 5-55).

With the low levels of NORMs expected within the Laurel Formation and the mitigation measures in place (Table 5-56), BNR does not expect any NORM-contaminated material to be released to the environment that causes exposure to humans and risks human health. If an accidental release from the water retention pond or drilling sump did occur, impacts to human health are not expected because the NORM concentrations from the Laurel Formation have proven to be low and below the levels set out by industry guidelines.

5.8.6 Mitigation

Table 5-56 summarises the mitigation measures and their hierarchy that will be included in the EP for assessment and acceptance by DEMIRS.

Table 5-56: Proposed mitigation measures – human health

Mitigation hierarchy	Mitigation measure	Further information
Minimise	Produced formation water storage pond design	As per WQPN 26 (DoW, 2013), all lined storage compounds should have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowing for any evaporative water loss and the effects of any water re-use recovery system.
Minimise	Pond design	In accordance with WQPN 26 (DoW, 2013), surface ponds used for short-term containment of wastewater or solids that may leach contaminants, require synthetic membranes and need to meet specific requirements, which include: • all fluid containment liners should have a coefficient of permeability of less than 2×10^{10} m/s

Mitigation hierarchy	Mitigation measure	Further information
		• a minimum thickness of 0.75 mm • dual liners • leak detection
Minimise	Waste management	All produced formation water will be managed in accordance with the principles detailed in Table 2-8.
Minimise	Monitoring/testing	As detailed in Appendix E, BNR will sample produced formation water (from within water retention ponds) and drill cuttings (from the mud sumps) for CoPC, including NORMs.

5.8.7 Environmental outcomes

The outcome of the Proposal is predicted to be:

- no impacts to human health by industrial processes that result in the build-up and release of radioactive substances or emissions.

Based on the predicted outcome for the Proposal, BNR does not believe that the Proposal will result in a significant impact to human health. The environmental mitigation measures intended to manage and minimise impacts to human health are considered effective. Consequently, BNR believes that the EPA's objective to:

'protect human health from significant harm'

can be met.

BNR has considered the WA Environmental Offsets Policy and does not believe actions to offset the predicted outcomes of the Proposal are required because the Proposal is not expected to have a significant impact on human health.

5.9 Subterranean fauna

5.9.1 EPA objective

To protect subterranean fauna so that biological diversity and ecological integrity are maintained.

5.9.2 Policy and guidance

- Environmental Factor Guideline Subterranean Fauna (EPA, 2016l)
- Technical Guidance Subterranean fauna survey (EPA, 2013).

5.9.2.1 Application of the Environmental Scoping Document

The ESD was published on 8 November 2021 to define the form, content, timing, and procedure of the environmental review, required by Section 40(3) of the EP Act. Table 5-57 lists the ESD requirements specific to subterranean fauna.

Table 5-57: ESD checklist – subterranean fauna

Subterranean fauna		
Required work		**BNR response**
87	Conduct a desktop assessment of the subterranean fauna and their habitat to inform local and regional context.	Section 5.9.3
88	Undertake an assessment of potential impacts to Subterranean Fauna in accordance with EPA guidance.	Section 5.9.5
89	Conduct an assessment of potential impacts from HFS activities to subterranean fauna. The assessment should explain if drill fluids or other chemicals of environmental significance are detrimental to subterranean fauna or their habitat.	Section 5.9.5

Subterranean fauna		
Required work		**BNR response**
90	Discuss the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the Proposal has addressed the mitigation hierarchy in relation to impacts on subterranean fauna.	Section 5.9.6
91	Outline the outcomes/objectives, management, monitoring, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted.	Appendix E Appendix L Linked to Inland Waters factor and impacts
92	Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.	Section 5.9.7

5.9.3 Receiving environment

WA's subterranean fauna is recognised as being globally significant because of its extraordinarily high species richness and high levels of endemism. Significant subterranean fauna assemblages have been recognised through their listing in some TECs and PECs. These fauna may have important ecosystem service functions, such as maintaining water quality in groundwater aquifers.

The presence of subterranean fauna is strongly linked to the geology and hydrology of the area as well as the availability of suitable microhabitats, such as non-hypersaline aquifers for stygofauna (Innovative Groundwater Solutions, 2015) and air-filled voids or caves for troglofaunal.

The Liveringa Formation is the uppermost aquifer in the Development Envelope (Figure 5-16) and comprises mainly fine-grained sediments (siltstone and shale), with more-permeable sandstone beds being less common. The shallow shale and siltstone sediments of the formation provide a potential habitat for stygofauna; however, bore yields in the Development Envelope suggest that permeability is low, and thus it is less likely that stygofauna would be present. Groundwater salinity in the Liveringa Aquifer is within a range that stygofauna are known to occur, with salinities of local bores ranging from 450 to 1,600 mg/L TDS (Rockwater, 2016).

The absence of caves or significant voids in the fine-grained sediments within the immediate surrounding region indicates that there is unlikely to be suitable habitat for troglofaunal (Bennelongia, 2023, attached as Appendix S). Further analysis of subterranean fauna presence, including a review of previous records and sampling undertaken near the Development Envelope, is provided by Rockwater (2016) in Appendix I.

Based on the results of previous sampling, it appears that sandstone aquifers of the Kimberley region contain moderately diverse stygofauna communities with very few stygofauna species restricted to small (project-level) scales (Rockwater, 2016). The range of groundwater salinities are within the tolerance levels recorded for stygofauna, and the shale and siltstone of the Liveringa Aquifer could potentially provide habitats for stygofauna. However, the reported low yields from bores screened in this formation suggest that suitable voids within sediments may be limited. The absence of more-permeable sandstone lithologies previously reported to support stygofauna communities in the Kimberley region may indicate that the potential for stygofauna is moderate to low (Rockwater, 2016). The regional extent of aquifers in the Development Envelope, and absence of any geological barriers that may prevent dispersal, suggest that any stygofauna community likely has an unrestricted distribution.

Bennelongia undertook a desktop assessment in October 2023 (Appendix S) and found 21 species of stygofauna records in an area covering 100 x 100 km^2 around the project area, but no TECs or PECs.

5.9.4 Potential impacts

5.9.4.1 Direct impacts

The Proposal may cause this local change to habitat, which has the potential to result in impacts to subterranean fauna:

- groundwater drawdown of surficial aquifers associated with water extraction.

5.9.4.2 Indirect impacts

This indirect impact may occur:

- contamination of surficial aquifers from an accidental release (of drilling fluids, HFS chemicals, liquid hydrocarbons, or produced formation water) at the surface.

5.9.5 Assessment of impacts

5.9.5.1 Groundwater drawdown of surficial aquifers associated with water extraction

Section 5.4.5.1 details the impact evaluation for groundwater drawdown. In summary, the modelled drawdown at the end of the six-month pumping period for Mod 1 (the Liveringa Aquifer) showed potential for a 0.2 m drawdown within 400 metres of each pumping bore assuming that all 10 well sites were abstracting water at the same time (Intera Geosciences Pty Ltd, 2023). However, given this model provides an unrealistic representation of groundwater drawdown as all well sites will not be pumping at the same time, and given the proximity of the Muspelheim wellsite to Mount Hardman Creek (1 km), additional predictive modelling for Mod 1 was performed with pumping only applied to the Muspelheim wellsite to provide an informed and realistic indication of potential drawdown exposure to the GDE. Modelling indicates that for a single wellsite a 10cm drawdown is expected 400 m from the pumping bore reducing to 2 cm at 500 m and 1 mm drawdown at 700 m (Intera Geosciences Pty Ltd, 2023).

These figures indicate the Proposal will result in only small-scale drawdown impacts, that will not impact or expose water resources (such as Mt Hardman creek) where GDEs may be present.

Consequently, any impacts to groundwater levels attributed to the Proposal are expected to be highly localised and temporary, and therefore are not expected to result in any impact to subterranean fauna values, their diversity, or abundance within the Development Envelope.

5.9.5.2 Potential contamination of surficial aquifers from an accidental release (of drilling fluids, HFS chemicals, liquid hydrocarbons, or produced formation water) at the surface

The highest potential for impact to subterranean fauna occurs during the drilling of the top-hole section. However, as detailed in Section 5.4, BNR will use a low-toxicity mud system that poses very low risk to the environment, and consequently, very low risk to any subterranean fauna populations. The composition of this fluid system is provided in Appendix A.

A spill from one of the water retention ponds used to support the Proposal, or a spill from a chemical or chemical additive (unmixed) to the ground, will result in varying levels of exposure depending on the volume of release. However, as described in Section 5.4.3, based on the depth to groundwater, any surface release is expected to take 70–300 days to travel from the ground surface to the water table (Rockwater, 2016).

As detailed in Section 5.2.5.2, a large spill event (e.g. 75 m^3 of diesel) would only be expected to seep through soils to a depth of ~0.5 m. Consequently, it is extremely unlikely that any release would cause the groundwater to be contaminated. Because surface spill events are well understood, a standard suite of preventive and management measures (including spill response and recovery arrangements) would ensure that, should a spill occur, impacts to groundwater quality (if any) would be negligible.

If standard mitigation measures are implemented, BNR does not expect this indirect impact to cause a significant environmental impact and thus an impact to subterranean fauna and their values.

5.9.6 Mitigation

Table 5-58 summarises the mitigation measures and their hierarchy These will be included in an EP for assessment and acceptance by DEMIRS under the PGER(E)R before activities commence. As detailed in the risk assessment, the source receptor pathways that would cause impacts to subterranean fauna are associated with groundwater drawdown and spill events. As such mitigations documented in Table 5-58 are duplicated from Section 5.4.6 and Section 5.2.

Table 5-58: Proposed mitigation measures – subterranean fauna

Mitigation hierarchy	Mitigation measure	Further information
Avoid	Surface casing cemented across all useable freshwater aquifers	In accordance with the Guidelines for the protection of surface and groundwater resources during exploration and appraisal drilling (DMPR, 2002), the potential for contaminating groundwater resources will be managed by installing casing that is secured / sealed by a sealing material such as cement.
Avoid/Minimise	Part IV Groundwater Management Plan	As required by the ESD Item 4, BNR has developed a GWMP (Appendix M) that documents the groundwater monitoring requirements along with management actions associated with trigger and threshold criteria that must be implemented. BNR believes that with the triggers detailed in the GWMP, groundwater sensitivities (such as subterranean fauna) will be protected.
Minimise	Chemical and hazardous liquid material storage	As per Australian Standard AS 1940:2004 recommendations, BNR will ensure that: • secondary containment for hazardous materials, chemicals, and hydrocarbons comprises a volume that equals 110% of the largest container within the contained area or 25% of the combined tank volumes tanks are double-skinned.
Minimise	Produced formation water storage pond design	As per WQPN 26 (DoW, 2013), all lined storage compounds will have sufficient freeboard (at least 500 mm) maintained to prevent unintended overflow of water from storms with an average return frequency of at least 20 years, plus capacity to store rainfall resulting from a 90th percentile wet season, after allowing for any evaporative water loss and the effects of any water re-use recovery system. All water storage ponds will be designed to meet these requirements.
Minimise	Groundwater monitoring bore installation	Installation and drilling of all water bores (including abstraction bores) will be hydro stratigraphically logged in detail and geophysical interpretation of groundwater quality collected, for the interval where fresh aquifers are known to be present (including through the Grant formation). Annulus seals and gravel packs will be used, where necessary, to isolate the zone being monitored and prevent potential cross contamination via the bore casing as required by the Minimum Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee, 2011) required to be followed as detailed in the Groundwater monitoring in the onshore petroleum and geothermal industry guideline (DMP & DoW, 2016). BNR will conduct validation water samples (along with QA/QC samples of any fluids / water used for the bore installation process) at a point of discharge from the circulation system to understand if cross contamination may be occurring as evidenced by fluid constituent presence associated with bore installation. This may involve the use of tracer dyes, but these specifics are subject to local conditions, aquifer depths and will be directed by a hydrogeologist during bore installation.
Minimise	Pond design	In accordance with WQPN 26 (DoW, 2013), surface ponds used for short-term containment of wastewater or solids that may leach contaminants, require synthetic membranes and need to meet specific requirements, including: • all fluid containment liners should have a coefficient of permeability of less than 2×10^{10} m/s • a minimum thickness of 0.75 mm • dual liners • leak detection. All surface ponds will be constructed to meet these requirements.
Minimise	Low-toxicity mud system	BNR plans to use a low-toxicity mud system for the top-hole section that, if lost to the environment, is not expected to result in environmental impacts.
Minimise	Chemical disclosure	In accordance with ESD Items 5, 6, and 8, a summary of all chemicals that may be used as ingredients in drilling and hydraulic fracture is included in Appendix A.

Mitigation hierarchy	Mitigation measure	Further information
		As per the requirements of Regulation 9 of PGER(E)R 2012, chemicals or substances must be disclosed for acceptance by DEMIRS before commencing activities where they are: • in, or added to, any treatment fluids to be used for drilling or hydraulic fracturing undertaken in the course of the activity • otherwise introduced into a well, reservoir, or subsurface formation in the course of the activity. In addition, all chemicals to be used downhole under the Proposal must be included on the Australian Inventory of Chemical Substances (AICS) or are otherwise approved for use in Australia. The chemicals will be used solely for the activity purpose they will serve as stated under the EP. The constituents, toxicity, ecotoxicity, and bioaccumulation data of each chemical product or system will be disclosed.
Minimise	Groundwater licences for extraction bores	In accordance with the RIWI Act, all water extraction must be licensed prior to take because the Development Envelope is located within a proclaimed groundwater area (DoW, 2010). BNR will ensure all groundwater licences are in place and kept up to date.
Minimise	Meter calibration and monitoring for extraction bores	As described in the Measuring the taking of water guidelines (DoW, 2016), Clause 46 of Schedule 1 of the RIWI Act state that licensees may be subject to metering, which is recognised as an accurate and reliable measuring technique. This is further expressed in the RIWI Regulations 2020, which now require water licences with annual water entitlements of between 10 – 50ML per year to install meters. Meters will be installed as required.
Minimise	Oil Spill Contingency Plan (OSCP)	Regulation 15 of PGER(E)R 2012 requires that an OSCP be developed for the Proposal and accepted by DEMIRS before conducting any petroleum activities.
Minimise	Spill kits	As directed by the OSCP, spill kits will be made available onsite to support the first strike / immediate response actions in the event of a spill.

5.9.7 Environmental outcomes

The outcomes of the Proposal are predicted to be:

- no impacts to subterranean fauna demonstrated by:
  - no short-term significant drawdown of the aquifer
  - no change to groundwater quality.

Based on the predicted outcomes for the Proposal as shown throughout this document and, in particular, the groundwater abstraction modelling and the 2023 Bennelongia GDE survey undertaken for this project (Appendix S), BNR does not believe that the Proposal will result in a significant impact to subterranean fauna. The environmental mitigation measures intended to manage and minimise impacts on subterranean fauna are considered effective. Consequently, BNR believe that the EPA's objective to:

'protect subterranean fauna so that biological diversity and ecological integrity are maintained'

can be met.

BNR has considered the WA Environmental Offsets Policy and does not believe actions to offset the predicted outcomes of the Proposal are required because the Proposal is not expected to have a significant impact on subterranean fauna.

5.10 Other environmental factors or matters

BNR have done a comprehensive review and believe that the preliminary key factors cover all factors and matters relevant to the proposal. As such no other factors or matters have been identified.

5.11 Residual impact significance model – assessment

As detailed in the WA Environmental Offsets Guidelines (Government of Western Australia, 2014), the residual impact significance model (Figure 5-69) outlines how significance will be determined and when an offset is likely to be required, or may be required, in relation to relevant EPA environmental factors. The model identifies 4 levels of significance for residual impacts:

- unacceptable impacts – those impacts that are environmentally unacceptable or where no offset can be applied to reduce the impact. Offsets are not appropriate in all circumstances, as some environmental values cannot be offset
- significant impacts requiring an offset – any significant residual impact of this nature will require an offset. These generally relate to any impacts to species, ecosystems, or reserve areas protected by statute or where the cumulative impact is already determined to be at a critical level
- potentially significant impacts that may require an offset – the residual impact may be significant depending on the context and extent of the impact. These relate to impacts that are likely to result in a species or ecosystem requiring protection under statute or increasing the cumulative impact to a critical level. Whether these impacts require an offset will be determined by the decision-maker based on information provided by the proponent or applicant and expert judgement
- impacts that are not significant – impacts that do not trigger the above categories are not expected to have a significant impact on the environment and therefore do not require an offset. Application of the residual impact significance model is expected to ensure that the determination of significance of residual impacts is consistent, regardless of the regulatory process.

BNR has applied this model to the relevant Part IV environmental factors to determine if the residual impacts associated with the Proposal are significant and thus require offsetting (Table 5-59 and further detail in Section 5.11.1 - 5.11.3). Using the offsets guidelines (Government of Western Australia, 2014), this model was directly applied to these factors:

- flora and vegetation
- terrestrial fauna
- subterranean fauna

For all other factors, BNR reviewed the impact assessments, as detailed in the relevant sections of this ERD.

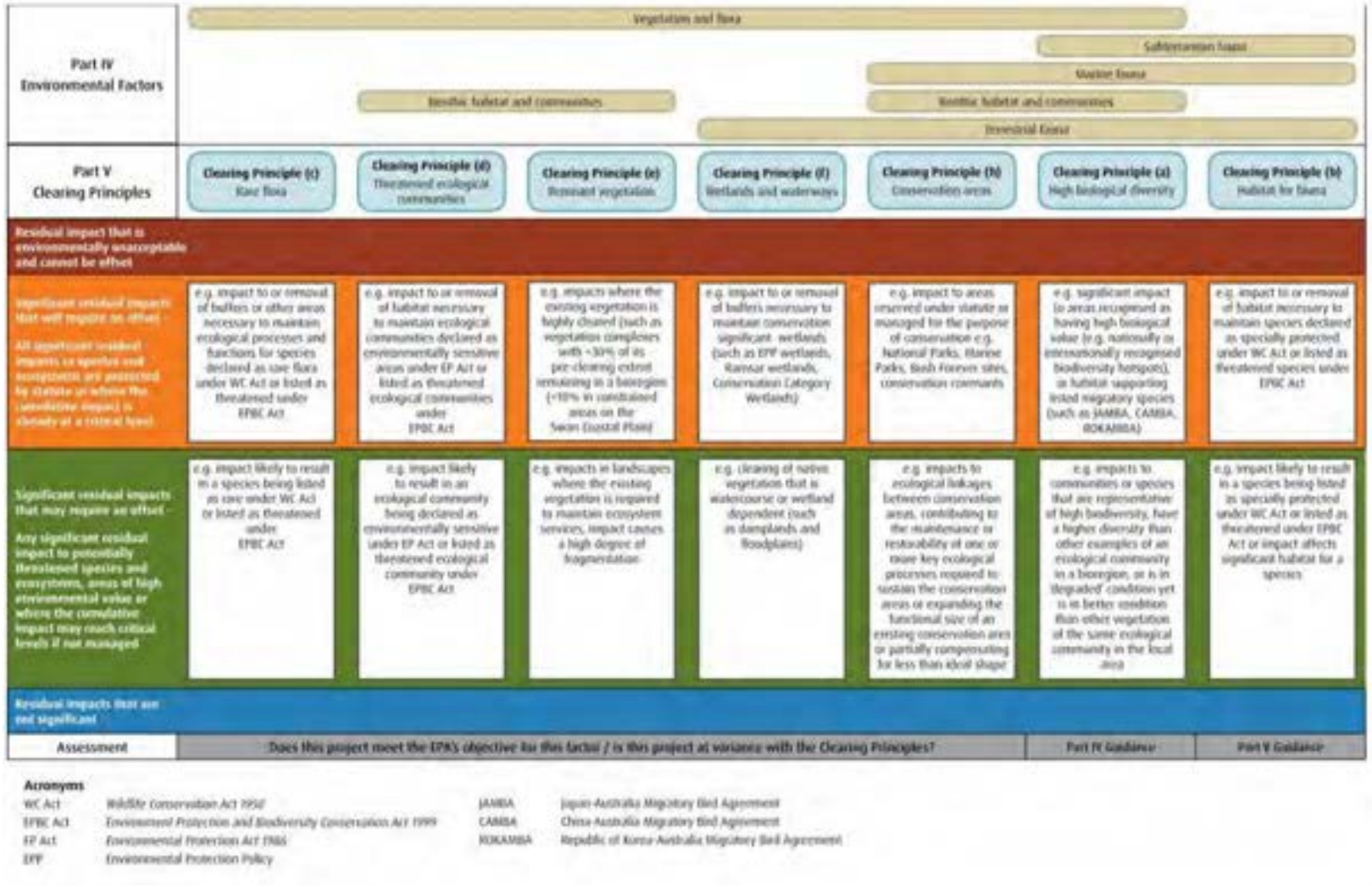

Figure 5-69: Residual impact significance model (Government of Western Australia, 2014)

Table 5-59: Residual Impact Significance table

Part IV Environmental Factors	Vegetation and Flora					Subterranean Fauna	Terrestrial Fauna	All factors
	Rare flora	Threatened ecological communities	Remnant vegetation	Wetlands & waterways	Conservation areas	High biological diversity	Habitat for fauna	Other
Residual impact that is environmentally unacceptable or cannot be offset	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
Significant residual impacts that will require an offset – All significant residual impacts to species and ecosystems protected by statute or where the cumulative impact is already at a critical level	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
Significant residual impacts that may require an offset – Any significant residual impact to potentially threatened species and ecosystems,	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified

areas of high environmental value or where the cumulative impact may reach critical levels if not managed								
Residual impacts that are not significant – Flora and Vegetation	The Proposal's impacts are not expected to result in any direct or indirect impacts to conservation significant species (Threatened and Priority flora species), therefore the residual impacts are not considered significant	Flora and vegetation surveys within the Development Envelope did not identify the presence of any TECs or PECs, as listed under the BC Act or EPBC Act	The vegetation associations are not considered remnant patches, or poorly represented vegetation associations (<30%) and are not expected to result in impacts that would affect ecosystem function. The residual impacts are not considered significant	The Proposal will not result in clearing of vegetation within a wetland, creek or river, the residual impacts are not expected to be significant	The Development Envelope does not intersect any conservation areas. Consequently, the residual impacts are not expected to be significant	The Proposal will not impact any vegetation communities that are known to comprise high biodiversity, thus the residual impacts are not expected to be significant	The Proposal is not expected to result in any impacts to fauna species or impacts to significant fauna habitat and is not expected to result in any impact to species listed under the BC Act or EPBC Act. The residual impacts are not expected to be significant	N/A
Residual impacts that are not significant – Terrestrial Fauna				BNR identified fauna habitat as being suitable for three migratory species being the: • Common sandpiper (*Actitis hypoleucos*) • Fork-tailed swift (*Apus pacificus*)	The Development Envelope does not intersect any conservation areas. Consequently, the residual impacts are not expected to be significant	The Proposal will not impact any fauna species or habitat that is known to have high biodiversity values, the residual impacts are not expected to be significant	The Proposal is not expected to result in any impacts to fauna species, impacts to significant fauna habitat, or to result in any impact to species listed under the BC Act or EPBC Act, and the residual	N/A

				• Sharp-tailed sandpiper (*Calidris acuminata*). As the Proposal will not result in clearing of vegetation within a wetland, creek or river, the residual impacts are not expected to be significant			impacts are not expected to be significant	
Residual impacts that are not significant – Subterranean Fauna						Given the impacts from these activities are limited, any indirect impacts to subterranean fauna would not be expected. Consequently, the residual impacts from this Proposal are not expected to be significant	Given the impacts from these activities are limited, any indirect impacts to subterranean fauna would not be expected. Consequently, the residual impacts from this Proposal are not expected to be significant	N/A

5.11.1 Flora and vegetation

The principles that are deemed relevant for this factor are:

- Declared rare flora
- threatened ecological communities
- remnant wetlands
- wetlands and waterways
- conservation areas
- high biological diversity.

An assessment of the Proposal against these principles is detailed in the subsections below.

5.11.1.1 Declared Rare Flora

BNR has modified the disturbance footprint to avoid impacts to conservation significant species. Specifically, BNR has rerouted access tracks (and the general siting of well sites) to avoid damp lands and creek lines thus avoiding conservation significant species known to be associated with these areas. Figure 5-2 summarises all conservation significant flora identified within the disturbance footprint of the Development Envelope. No DRF or Priority species are planned to be impacted by the Proposal.

The Proposal's impacts are not expected to result in any direct or indirect impacts to conservation significant species (DRF and Priority flora species), therefore the residual impacts are not considered significant.

5.11.1.2 Threatened Ecological Communities

Flora and vegetation surveys within the Development Envelope did not identify the presence of any TECs or PECs, as listed under the BC Act or EPBC Act. The areas surveyed are considered representative of the expected flora and vegetation composition throughout the entire Development Envelope; therefore, BNR does not expect any TEC or PEC to be impacted by the Proposal.

Because the Proposal's impacts are not expected to result in any direct or indirect impacts to TECs or PECs, the residual impacts are not considered significant.

5.11.1.3 Remnant vegetation

Flora and vegetation surveys within the Development Envelope confirmed the presence of four predominant vegetation associations. The vegetation associations within the Development Envelope are well represented locally (see Table 5-5 for the Proposal's impact). The direct impact of clearing is limited to no more than 0.054% of a single vegetation association, which is insignificant at a regional scale. Consequently, the Proposal is not expected to result in any landscape scale impacts, and any fragmentation would be limited to localised impacts that are not expected to affect ecosystem functioning or restrict movement of local species.

Because the vegetation associations are not considered remnant patches, or poorly represented vegetation associations (<30%) and are not expected to result in impacts that would affect ecosystem function, the residual impacts are not considered significant.

5.11.1.4 Wetlands and waterways

Many tributaries of the surface fluvial system draining into the Fitzroy River are ephemeral streams or swale washes during the long dry season. The surface water lines within the Development Envelope (Figure 5-36) all have such ephemeral waterbodies. The only recognised surface waterbody within the Development Envelope is Mount Hardman Creek, which is also defined as a GDE.

BNR does not plan to clear vegetation associated with the GDE or vegetation associated with other perennial waterways. Because the Proposal will not result in clearing of vegetation within a wetland, creek or river, the residual impacts are not expected to be significant.

5.11.1.5 Conservation areas

As detailed in Section 5.1.3.2 and seen in Figure 5-3, the Development Envelope does not intersect any conservation areas. Consequently, the residual impacts are not expected to be significant.

5.11.1.6 High biological diversity

CSIRO (Pavey & Vanderduys, 2021) identified that 2,838 plant species were recorded within the Canning Basin, of which 220 species were classified as conservation significant. CSIRO (Pavey & Vanderduys, 2021) also identified that 43 threatened ecological communities (TECs) are known to be present in the Canning Basin. In the absence of suitable data at a sub-regional perspective, BNR reviewed species richness of the Fitzroy Trough by interrogating the Atlas of Living Australia database. The Atlas of Living Australia database identified that 1306 flora species have been recorded within the Fitzroy Trough (Atlas of Living Australia, 2023). In addition to this, four flora species classified as conservation significant and one threatened Ecological Community are known to be present (Graham, 2001).

The flora and vegetation survey commissioned by BNR recorded 235 flora species representing 54 families and 130 genera from 64 quadrats. The average diversity per quadrat was 27 species, ranging from a low of seven species to a high of 53 species. A species accumulation curve determined that the number of flora species recorded represents ~91.7% of the species potentially present within the Development Envelope.

Noting that 2,838 species are known to be present within the Canning Basin, the species identified within Development Envelope comprise only eight per cent of the species recorded.

For a more localised comparison, noting that 1,306 species are known to be present within the Fitzroy Trough IBRA sub-region, the species identified within Development Envelope comprise 18 per cent of the species recorded.

This indicates that within the Canning Basin (regional) and Fitzroy Trough (sub-regional), the level of species diversity within the Development Envelope is limited. As the Proposal will not impact any vegetation communities that are known to comprise high biodiversity, the residual impacts are not expected to be significant.

5.11.1.7 Habitat for fauna

As detailed in Section 5.3.3.1, the Development Envelope contains three broad fauna habitat types. An assessment against conservation significant fauna species that may be present within the Development Envelope indicates that this habitat may provide habitat for the:

- Gouldian Finch (*Erythrura gouldiae*)
- Greater Bilby (*Macrotis lagotis*)
- Northern Short-tailed Mouse (*Leggadina lakedownensis*)
- Spotted Ctenotus (northeast) (*Ctenotus uber johnstonii*).

The habitat throughout the Development Envelope and beyond as widely ubiquitous. During the most recent surveys, no bilbies (or recent burrows) were recorded or identified; however, the Greater Bilby is known to be present within the region based upon diggings identified by Eco Logical Australia . Eco Logical Australia indicate that although vegetation within the southeast of the Development Envelope could be considered as appropriate bilby habitat, suitable habitat is also widely available throughout the wider region. All fauna habitat identified is not considered as significant habitat (or habitat critical to the survival of the species).

As the Proposal is not expected to result in any impacts to fauna species or impacts to significant fauna habitat and is not expected to result in any species being listed under the BC Act or EPBC Act, the residual impacts are not expected to be significant.

5.11.2 Terrestrial fauna

5.11.2.1 Wetlands and waterways

As detailed in Section 5.3.3.1, BNR identified fauna habitat as being suitable for three migratory species being the:

- Common sandpiper (*Actitis hypoleucos*)
- Fork-tailed swift (*Apus pacificus*)
- Sharp-tailed sandpiper (*Calidris acuminata*).

These species are vagrant and mobile but were identified as having the potential to use habitat within the disturbance footprint when conditions are favourable (e.g. after periods of heavy rainfall).

However, given the extent of similar habitat within and surrounding the Development Envelope, removing a small amount of vegetation in this area is not expected to result in any impacts to migratory species given the disturbance will not restrict them accessing nearby habitat if required. BNR has amended the disturbance footprint to prevent impacts to damp land communities. As the Proposal will not result in clearing of vegetation within a wetland, creek or river, the residual impacts are not expected to be significant.

5.11.2.2 Conservation areas

As detailed in Section 5.1.3.2, the Development Envelope does not intersect any conservation areas. Consequently, the residual impacts are not expected to be significant.

5.11.2.3 High biological diversity

CSIRO (Pavey & Vanderduys, 2021) identified that 857 vertebrate species were recorded within the Canning Basin, with 155 of these species classified as conservation significant.

Although no conservation listed species were directly sighted during the 2021 on-ground basic fauna survey , of the 54 conservation listed fauna species identified in the 2021 fauna report's desktop assessment (pre-likelihood of occurrence), nine are considered as having the potential to occur post-survey, based on the location of previous records (sightings) to the Development Envelope and availability of suitable habitat within the Development Envelope.

Although 155 fauna species of conservation significance are known to be present within the Canning Basin, the fauna species likely present within Development Envelope only comprise six per cent of the species recorded across in the Canning Basin—the level of species diversity in the Development Envelope is low.

Because the Proposal will not impact any fauna species or habitat that is known to have high biodiversity values, the residual impacts are not expected to be significant.

5.11.2.4 Habitat for fauna

As detailed in Section 5.3.3.1, the Development Envelope contains three broad fauna habitat types. An assessment against conservation significant fauna species that may be present within the Development Envelope indicates that this area may provide habitat for the:

- Gouldian finch (*Erythrura gouldiae*)
- Spotted Ctenotus (northeast) (*Ctenotus uber johnstonii*)
- Northern short-tailed mouse (*Leggadina lakedownensis*)
- Greater Bilby (*Macrotis lagotis*).

The habitat throughout the Development Envelope and beyond is widespread. During the most recent surveys, no bilbies (or recent burrows) were recorded or identified; however, the Greater Bilby is known to be present within the region based on diggings identified by Eco Logical Australia . Eco Logical Australia indicate that although vegetation within the southeast of the Development Envelope could be considered as appropriate bilby habitat, suitable habitat is also widely available throughout the region. All fauna habitat identified is not considered as significant habitat (or habitat critical to the survival of the species) for the conservation significant species.

Therefore, the Proposal is not expected to result in any impacts to fauna species, impacts to significant fauna habitat, or to result in any species being listed under the BC Act or EPBC Act, and the residual impacts are not expected to be significant.

5.11.3 Subterranean fauna

The principles that are deemed relevant for this factor are:

- high biological diversity
- Habitat for fauna

An assessment of the Proposal against these principles is detailed in the subsections below.

5.11.3.1 High biological diversity / habitat for fauna

Based on results of previous sampling, the sandstone aquifers of the Kimberley region contain moderately diverse stygofauna communities with very few stygofauna species restricted to small (project level) scales. The range of groundwater salinities are within the tolerance levels recorded for stygofauna, and the shale and siltstone of the Liveringa Aquifer could potentially provide habitats for stygofauna. However, the reported low yields from bores screened in this formation suggest that suitable voids within sediments may be limited. The absence of more-permeable sandstone lithologies previously reported to support stygofauna communities in the Kimberley region may indicate that the potential for stygofauna is moderate to low. The regional extent of aquifers in the Development Envelope, and absence of any geological barriers that may prevent dispersal, suggest that any stygofauna community is unlikely to have a restricted distribution.

Although subterranean fauna have been identified within the region previously, there are no known hotspots or habitat that would signify high abundance of these communities within the Development Envelope.

Given impacts to subsurface are limited (limited to the excavation of the well cellar and drill pipe), direct impacts are not expected. Indirect impacts associated with changes to hydrological regime and accidental releases have been discussed in Section 5.4.4. Given the impacts from these activities are limited, any indirect impacts to subterranean fauna would not be expected. Consequently, the residual impacts from this Proposal are not expected to be significant.

6 Holistic impact assessment

A holistic impact assessment considers the environmental effect of two or more environmental factors or values that have the potential to expose the same receptors (EPA, 2024). To understand the connections between factors and receptors, BNR has developed a conceptual model, as presented in Table 6-1. This model identifies the connections between factors and receptors in this Proposal. If more than one factor had the potential to expose a single receptor, this value was assessed.

Table 6-1: Holistic impact assessment conceptual model

	Vegetation communities	Flora	Groundwater (GDE)	Soil	Fauna	Groundwater users	Aboriginal communities	Air quality
Flora and vegetation	✓	✓						
Terrestrial environmental quality				✓				
Terrestrial fauna	✓				✓			
Inland waters			✓			✓		
Social surrounds	✓					✓	✓	✓
Air quality								
GHG emissions								
Human health								
Subterranean fauna								

6.1.1 Vegetation communities

Vegetation communities provide multiple values across multiple factors. After the environmental impact assessment was completed, BNR reviewed the impacts associated with clearing vegetation communities. In summary, these impacts included:

- reducing the extent of the community (Section 5.1.5)
- reducing available fauna habitat (Section 5.3.5)
- reducing the amenity and aesthetics of a place (Section 5.5.5).

When considering these impacts together is there any potential for combined environmental effects?

BNR considered if there was any connection between these impacts that would increase the outcomes of the individual environmental impact assessment.

As the vegetation communities are well represented and widespread throughout the Development Envelope (and the Kimberley region), clearing should not result in any amenity or aesthetic impacts, with the siting of the well site and access tracks responsible for any incidental aesthetic impacts. The vegetation communities do not provide any critical habitat for conservation significant fauna species, thus clearing should not result in a significant impact to fauna. Consequently, the combined environmental effect is not expected to result in a significant environmental impact and therefore no additional mitigation measures are required to mitigate combined environmental effects.

6.1.2 Groundwater users

After the environmental impact assessment was completed, BNR reviewed the impacts to groundwater users. In summary, these impacts included:

- reducing availability of groundwater for other users (Section 5.3.5)
- contamination of useable aquifers (Section 5.5.5).

When considering these impacts together is there any potential for combined environmental effects?

BNR considered if there was any connection between these impacts that would increase the outcomes of the individual environmental impact assessment.

On review, BNR considers these impacts to be mutually exclusive–the impact of groundwater drawdown may prevent access to groundwater, and the exposure to contaminated aquifers requires access to groundwater.

Consequently, no further assessment was completed because there is no connection between these impacts that would result in a combined impact greater than that assessed in the environmental impact assessment.

7 Cumulative impact assessment

The ESD was published on 8 November 2021 to define the form, content, timing, and procedure of the environmental review, required by Section 40(3) of the EP Act. The ESD included specific requirements to complete accumulative impact assessment for specific factors. This Section assesses the cumulative impacts for various environmental factors, as required by the ESD. Specifically, the ESD requested a cumulative impact assessment be considered with a focus on these factors:

- inland waters
- terrestrial fauna
- flora and vegetation
- social surroundings.

To inform the cumulative assessment of the Proposal, BNR considered the context of other known developments near the Development Envelope. As detailed in Sections 5.5.3.1 and 5.5.3.2, the Development Envelope overlays two pastoral stations (leased Crown land)—Blina Station and Noonkanbah Station—who lease the land for pastoral grazing.

A search of the Plan WA website (DPLH, 2021b) did not identify any other planned developments near the Development Envelope. Consequently, the cumulative impact assessment of the Proposal is limited to those direct impacts associated with the Proposal, other EP 371 petroleum activities, and pastoral grazing activities.

7.1 Inland waters

As detailed in Section 5.4.3, a search for licensed water users within the Development Envelope identified only one other water licence targeting the Liveringa Aquifer, as detailed in Table 5-23. BNR currently has three groundwater licences but has extracted little to no water during the annual care and maintenance program of its assets on EP 371.

Currently, there are ~25 groundwater licences in the wider catchment, with an approximate allocation of <2 GL per year (Harrington & Harrington, 2015). Most groundwater licences are for Aboriginal community bores, some pastoral bores (for diversified activities other than livestock and domestic use), and limited horticultural activities. Unlicensed water use includes livestock and domestic bores (pastoral industry) and Aboriginal community bores.

The nearest licensed groundwater user outside the Development Envelope is the Yungngora Community, ~18 km south of the Development Envelope. BNR understands that other pastoral bores are prevalent throughout the Development Envelope; however, their use and volume of water extracted is not currently known. A review of known pastoral bore locations determined that no pastoral bore is located within 1.5 km of the well sites and modelling of groundwater abstraction (Intera Geosciences 2023) has demonstrated no impact to these wells.

Table 7-1: Summary of groundwater extraction licences targeting the Liveringa Aquifer

Licence Number	Issue date	Expiry date	Allocation (ML)	Owner
174685	05 Oct 2020	04 Oct 2030	309	Main Roads
167493	07 Jan 2021	10 Sep 2023	30	BNR
179134	07 Jan 2021	10 Sep 2023	33.4	BNR
179166	07 Jan 2021	10 Sep 2023	39.4	BNR

The Proposal requires water on a per well basis, and continual water extraction during the activities is not required. Quantitative drawdown modelling (verified by in-field monitoring from previous extraction activities) indicates that only a short-term drawdown would be experienced near the extraction bore (<55 m). Given the distance between well sites, and on the unrealistic assumption that water is extracted from all well sites at the same time, there would be no overlap in groundwater depressions.

No pastoral bores are known to be within 1.5 km of the well sites; therefore, there should be no overlap in groundwater depressions associated with pastoral and Proposal use. Even if there was overlap, any

cumulative impacts would be limited in duration and cease once water extraction was complete. Consequently, cumulative impacts across the Proposal are not expected.

7.2 Terrestrial fauna

As detailed in Section 5.3.3, BNR completed a fauna survey for the disturbance footprint within the Development Envelope , attached as Appendix B. The Development Envelope was characterised into three broad fauna habitat types. An assessment against conservation significant fauna species that may be present within the Development Envelope indicates that this area may provide habitat for the:

- Gouldian Finch (*Erythrura gouldiae*)
- Spotted Ctenotus (northeast) (*Ctenotus uber johnstonii*)
- Northern Short-tailed Mouse (*Leggadina lakedownensis*)
- Greater Bilby (*Macrotis lagotis*).

Other activities within the Development Envelope are limited to pastoral activities, therefore the cumulative impacts to these species are associated with direct disturbance to vegetation and damage to habitat. Cumulative impacts associated with clearing are detailed in Section 7.3.

7.3 Flora and vegetation

A search of the Plan WA website (DPLH, 2021b), DEMIRS EARS website and DWER Clearing Permit System did not identify any other planned developments within or near the Development Envelope. At the time of writing this ERD, the only other petroleum Proposal BNR was aware of near the Development Envelope was the Odin 2D Seismic Survey, located within the Development Envelope itself (Fig.7-1). Consequently, the cumulative impact assessment of the Proposal is limited to those direct impacts associated with:

- existing EP 371 assets (in care and maintenance)
- this Proposal
- Odin 2D Seismic Survey[19]
- pastoral grazing activities.

The Odin 2D Seismic Survey proposes to collect a high-quality 2D dataset that can be used to map geological formations to assist in the identification of gas reserves and detailed reservoir development. The seismic program comprises six lines of temporary clearing (with lines rehabilitated post clearing) totalling 55ha of clearing (Table 7-2). A summary of the activity can be found here: https://ace.dmp.wa.gov.au/ACE/Public/PetroleumProposals/ViewPlanSummary?registrationId=101018 .

Table 7-2 summarises the total clearing impacts associated with these activities, while Table 7-3 breaks down the clearing impacts to specific vegetation associations. The data indicate that the cumulative clearing impacts may result in impacts to <0.058% of a single vegetation association. Compared to the extent and distribution of these associations in the vicinity of the surveys and regionally, removing 0.058% of a vegetation association is not considered significant.

Consequently, the cumulative impact associated with the clearing associated with this Proposal is not considered significant when considered in combination with other known activities near the Development Envelope.

Table 7-2: Clearing impacts associated with various activities

Activity	Vegetation associations	Total proposed clearing or existing disturbance footprint (ha)
Existing EP 371 assets (already cleared and disturbed	North Fitzroy Plain_64 North Fitzroy Plain_699	~8.1 ~8.8

[19] The location of the Odin 2D Seismic Survey is provided in Figure 7-1

Activity	Vegetation associations	Total proposed clearing or existing disturbance footprint (ha)
areas, with some maintained areas)	North Fitzroy Plain_700	~7.6
This Proposal	North Fitzroy Plain_699 North Fitzroy Plain_700 North Fitzroy Plain_710	~5 ~86 ~14
Odin 2D Seismic Survey	North Fitzroy Plain_700 North Fitzroy Plain_710 North Fitzroy Plain_712	~30.9 ~23.5 ~0.6
Pastoral grazing activities	Unknown (not publicly available)	Unknown (not publicly available)

Table 7-3: Cumulative impact and associated vegetation communities

Vegetation association	Cumulative clearing impact (ha)	Current extent (ha) present within the subregion	Cumulative impact % clearing
699	~13.8	179,963.89	0.0076 %
700	~124.5	212,971.66	0.058 %
710	~14.6	25,596.64	0.057 %

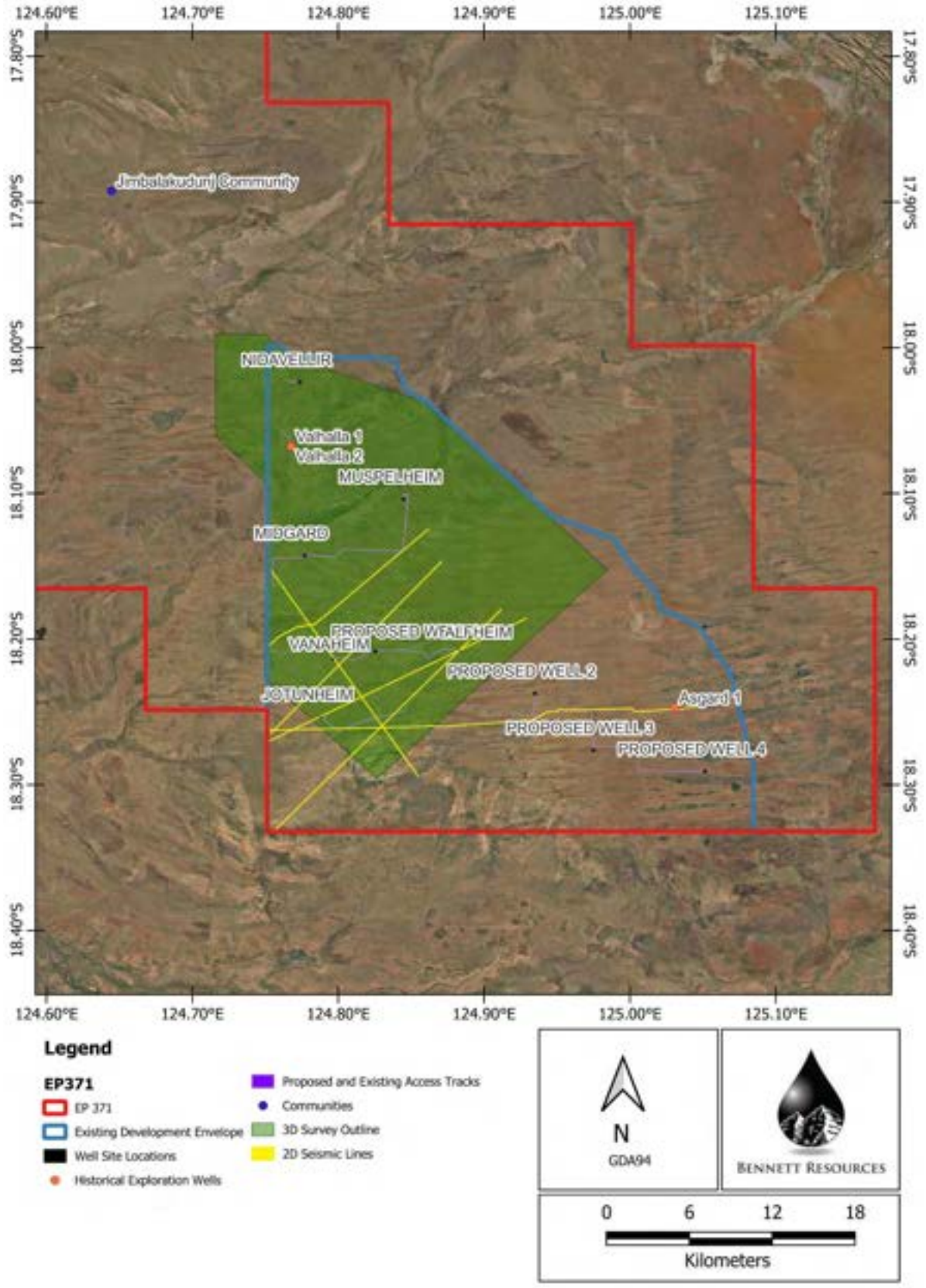

Figure 7-1 Odin seismic survey and location within the Development Envelope

7.4 Social surroundings

A search of the Plan WA website (DPLH, 2021b) did not identify any other planned developments within the Development Envelope. Therefore, the potential for cumulative noise impacts arising from this Proposal and other activities within the Development Envelope are non-existent. As detailed in Section 2, the Proposal plans a staged development for each well site, including:

- site preparation (well site construction)
- drilling activities
- HFS activities
- well testing.

The noise profile is likely to be different at each stage; however, the sound levels associated with HFS activities are expected to be the loudest so these were modelled to understand the extent to which environmental impacts may occur (see Section 5.5.5.2). Even if more than one well site was to operate simultaneously (which is not planned), they are significant enough distances away from each other that sound exposure extents would not overlap. Because the extent of impact does not overlap any sound-sensitive receptors and because sound attenuates rapidly to air, accumulative noise impacts are not expected; ambient noise levels are expected to return to normal almost immediately after each phase of the activity stops.

Consequently, the cumulative impacts arising from noise emissions are not expected to be significant.

Dust generation is significantly reduced during the wet season because the soil and roads are wet. Even if dust is generated at multiple sites, access tracks, and existing roads throughout the year, this will be negated by annual wet season rainfall that is likely to remove dust from vegetation within the Development Envelope. Consequently, the cumulative impact of dust to vegetation is not considered credible.

On the expectation that dust generated from the Proposal will be much less than that produced by bulk material loading/unloading, the EPA provides guidance that at least 1–2 km separation should be maintained between industrial and sensitive land uses (EPA, 2005). The separation from the general Development Envelope is >18 km from the nearest sensitive receptor; therefore, BNR does not believe that any cumulative impacts will arise from dust generation when combined with existing land uses and other activities known to occur within and near the Development Envelope.

No heritage sites have been impacted from historical petroleum activities within EP 371. The Proposal's heritage archaeological and ethnographic survey, which resulted in minor modifications to proposed access tracks, a camp and a proposed well site location, confirmed that the Proposal will not result in any impacts to heritage values. Consequently, no cumulative impacts are expected to heritage values.

The Yungngora and Warlangurru people are supportive of the Proposal and understand the potential benefits that a project such as this would have. They have seen the benefits that previous programs bring—such as training and employment opportunities—and have voiced their support for the Proposal. Although the Proposal may result in a change to the environment (associated with vegetation clearing), this can be mitigated over time because the Kimberley region has high rehabilitation success. Consequently, the cumulative impacts of the Proposal are not deemed significant by themselves, nor when considered in conjunction with the benefits that this Proposal should provide local people.

Blina Station and Noonkanbah Station cover areas of 254,600 ha and 172,400 ha, respectively. The clearing footprint of this Proposal is limited to 110 ha; therefore, the potential direct impact, and thus cumulative impact, is limited to <0.026% of the total area of these pastoral stations. Consequently, the Proposal is not expected to significantly impact pastoral station activities.

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Appendix A. Chemical Inventory

NEWPARK DRILLING FLUIDS

SAFETY DATA SHEET

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 Product identifier

Product name **BARITE POWDER**

Synonyms BARITE (API 13A SECTION 7) ● NEWBAR ● RHEOBAR

1.2 Uses and uses advised against

Uses DRILLING FLUID ADDITIVE ● WEIGHTING AGENT

1.3 Details of the supplier of the product

Supplier name **NEWPARK DRILLING FLUIDS (AUSTRALIA) LTD**

Address 11 Alacrity Place, Henderson, WA, 6166, AUSTRALIA

Telephone +61 8 9410 8200

Fax +61 8 9410 8299

Website www.newpark.com

1.4 Emergency telephone numbers

Emergency 1800 127 406 (Australia); +64 4 917 9888 (International)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

2.2 GHS Label elements

No signal word, pictograms, hazard or precautionary statements have been allocated.

2.3 Other hazards

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

3.1 Substances / Mixtures

Ingredient	CAS Number	EC Number	Content
BARIUM SULPHATE	7727-43-7	231-784-4	>89%
QUARTZ (CRYSTALLINE SILICA)	14808-60-7	238-878-4	<3%

4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes.

Inhalation If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.

Skin If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Continue flushing with water until advised to stop by a Poisons Information Centre or a doctor.

Ingestion For advice, contact a Poisons Information Centre on 13 11 26 (Australia Wide) or a doctor (at once).

First aid facilities Eye wash facilities should be available.

4.2 Most important symptoms and effects, both acute and delayed

Repeated exposure to crystalline silica may result in lung fibrosis (silicosis). Principal symptoms of silicosis are coughing and breathlessness. Crystalline silica is classified as carcinogenic to humans (IARC Group 1).

4.3 Immediate medical attention and special treatment needed

Treat symptomatically.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Use an extinguishing agent suitable for the surrounding fire.

5.2 Special hazards arising from the substance or mixture

Non flammable. May evolve toxic gases (sulphur oxides) when heated to decomposition.

5.3 Advice for firefighters

Evacuate area and contact emergency services. Toxic gases may be evolved in a fire situation. Remain upwind and notify those downwind of hazard. Wear full protective equipment including Self Contained Breathing Apparatus (SCBA) when combating fire. Use waterfog to cool intact containers and nearby storage areas.

5.4 Hazchem code

None allocated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS.

6.2 Environmental precautions

Prevent product from entering drains and waterways.

6.3 Methods of cleaning up

Contain spillage, then cover / absorb spill with non-combustible absorbent material (vermiculite, sand, or similar), collect and place in suitable containers for disposal.

6.4 Reference to other sections

See Sections 8 and 13 for exposure controls and disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, dry, well ventilated area, removed from incompatible substances and foodstuffs. Ensure containers are adequately labelled, protected from physical damage and sealed when not in use.

7.3 Specific end uses

No information provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Exposure standards

Ingredient	Reference	TWA		STEL	
		ppm	mg/m³	ppm	mg/m³
Barium sulphate	SWA [AUS]	--	10	--	--
Barium sulphate (inhalable)	SWA [Proposed]	--	4	--	--
Barium sulphate (respirable)	SWA [Proposed]	--	1.35	--	--
Quartz (respirable dust)	SWA [AUS]	--	0.1	--	--
Quartz (respirable dust)	SWA [Proposed]	--	0.05	--	--
Quartz (respirable dust)	WorkSafe VIC	--	0.05	--	--

Biological limits No Biological Limit Value allocated.

8.2 Exposure controls

Engineering controls Avoid inhalation. Use in well ventilated areas. Where an inhalation risk exists, mechanical extraction ventilation is recommended.

PPE

Eye / Face Wear dust-proof goggles.

Hands Wear PVC or rubber gloves.

Body When using large quantities or where heavy contamination is likely, wear coveralls.

Respiratory Where an inhalation risk exists, wear a Class P1 (Particulate) respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	OFF-WHITE POWDER
Odour	ODOURLESS
Flammability	NON FLAMMABLE
Flash point	NOT RELEVANT
Boiling point	NOT RELEVANT
Melting point	> 1300°C
Evaporation rate	NOT RELEVANT
pH	8.2 (20% Slurry)
Vapour density	NOT RELEVANT
Specific gravity	4.20
Solubility (water)	INSOLUBLE
Vapour pressure	NOT RELEVANT
Upper explosion limit	NOT RELEVANT
Lower explosion limit	NOT RELEVANT
Partition coefficient	NOT RELEVANT
Autoignition temperature	NOT RELEVANT
Decomposition temperature	NOT RELEVANT
Viscosity	NOT RELEVANT
Explosive properties	NOT EXPLOSIVE
Oxidising properties	NON OXIDISING
Odour threshold	NOT RELEVANT

9.2 Other information

Bulk density ~1.5 kg/L

10. STABILITY AND REACTIVITY

10.1 Reactivity
Carefully review all information provided in sections 10.2 to 10.6.

10.2 Chemical stability
Stable under recommended conditions of storage.

10.3 Possibility of hazardous reactions
Polymerization is not expected to occur.

10.4 Conditions to avoid
Avoid heat, sparks, open flames and other ignition sources.

10.5 Incompatible materials
Incompatible with oxidising agents (e.g. hypochlorites), acids (e.g. nitric acid), alkalis (e.g. sodium hydroxide), heat and ignition sources.

10.6 Hazardous decomposition products
May evolve toxic gases (sulphur oxides) when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity Based on available data, the classification criteria are not met.

Information available for the ingredients:

Ingredient	Oral LD50	Dermal LD50	Inhalation LC50
BARIUM SULPHATE	> 5000 mg/kg (rat)	> 2000 mg/kg (rat)	--

Skin Contact may result in irritation, redness, pain and rash.

Eye Contact may result in irritation, lacrimation, pain, redness and blurring or dimness of vision.

Sensitisation Not classified as causing skin or respiratory sensitisation.

Mutagenicity Not classified as a mutagen.

Carcinogenicity Crystalline silica is classified as carcinogenic to humans (IARC Group 1). However, there is a body of evidence supporting the fact that increased cancer risk would be limited to people already suffering from silicosis.

Reproductive Not classified as a reproductive toxin.

STOT - single exposure Over exposure may result in irritation of the nose and throat, coughing, dizziness, drowsiness and headache.

STOT - repeated exposure Repeated exposure to respirable silica may result in pulmonary fibrosis (silicosis). Silicosis is a fibronodular lung disease caused by deposition in the lungs of fine respirable particles of crystalline silica. Principal symptoms of silicosis are coughing and breathlessness.

Aspiration Not classified as causing aspiration.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Fish Toxicity: LC50 (Rainbow trout) > 7500 ppm/96hrs; LC50 (Fresh Water Trout) > 21,000 ppm/96hrs; LC50 (Salt Water Stickel Back) > 56,000 ppm/96hrs.

12.2 Persistence and degradability
Barium sulphate (major ingredient of barite (60-100%)) is insoluble in water and not biodegradable.

12.3 Bioaccumulative potential
Not expected to bioaccumulate.

12.4 Mobility in soil
No information provided.

12.5 Other adverse effects
This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste disposal Dispose of to an approved landfill or waste processing site. Contact the manufacturer/supplier for additional information (if required).

Legislation Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None allocated.	None allocated.	None allocated.
14.2 Proper Shipping Name	None allocated.	None allocated.	None allocated.
14.3 Transport hazard class	None allocated.	None allocated.	None allocated.
14.4 Packing Group	None allocated.	None allocated.	None allocated.

14.5 Environmental hazards

No information provided.

14.6 Special precautions for user

Hazchem code None allocated.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Classifications Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

Inventory listings **AUSTRALIA: AICS (Australian Inventory of Chemical Substances)**
All components are listed on AICS, or are exempt.

16. OTHER INFORMATION

Additional information

RESPIRATORS: In general the use of respirators should be limited and engineering controls employed to avoid exposure. If respiratory equipment must be worn ensure correct respirator selection and training is undertaken. Remember that some respirators may be extremely uncomfortable when used for long periods. The use of air powered or air supplied respirators should be considered where prolonged or repeated use is necessary.

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as form of product, method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: form of product; frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
GHS	Globally Harmonized System
GTEPG	Group Text Emergency Procedure Guide
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m³	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

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[End of SDS]

NEWPARK DRILLING FLUIDS

SAFETY DATA SHEET

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 Product identifier

Product name **NEWZAN D**

Synonyms NEWZAN D ● XANTHAN GUM (BIOPOLYMER) ● XANTHAN GUM (P)

1.2 Uses and uses advised against

Uses DRILLING FLUID ADDITIVE ● VISCOSITY MODIFIER

1.3 Details of the supplier of the product

Supplier name **NEWPARK DRILLING FLUIDS (NEW ZEALAND) LTD**

Address PO BOX 6092, Moturoa, New Plymouth, TARANAKI, 4310, NEW ZEALAND

Telephone 0204 0234 734

Fax +61 8941 08299

Website www.newpark.com

1.4 Emergency telephone numbers

Emergency 0800 243 622 (New Zealand); +64 4 917 9888 (International)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

NON HAZARDOUS ACCORDING TO NZ ENVIRONMENTAL PROTECTION AUTHORITY CRITERIA

2.2 GHS Label elements

No signal word, pictograms, hazard or precautionary statements have been allocated.

2.3 Other hazards

No information provided.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

3.1 Substances / Mixtures

Ingredient	CAS Number	EC Number	Content
XANTHAN GUM	11138-66-2	234-394-2	>90%

4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes.

Inhalation If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.

Skin If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Continue flushing with water until advised to stop by a Poisons Information Centre or a doctor.

Ingestion For advice, contact the National Poisons Centre on 0800 764 766 (0800 POISON) or +643 479 7248 or a doctor (at once). If swallowed, do not induce vomiting. Ingestion is considered unlikely due to product form.

First aid facilities Eye wash facilities and safety shower should be available.

4.2 Most important symptoms and effects, both acute and delayed

Adverse effects not expected from this product under normal conditions of use.

4.3 Immediate medical attention and special treatment needed
Treat symptomatically.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media
Dry agent, carbon dioxide, foam or water fog. Prevent contamination of drains or waterways.

5.2 Special hazards arising from the substance or mixture
Combustible. May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Finely divided dust may form explosive mixtures with air.

5.3 Advice for firefighters
Evacuate area and contact emergency services. Toxic gases may be evolved in a fire situation. Remain upwind and notify those downwind of hazard. Wear full protective equipment including Self Contained Breathing Apparatus (SCBA) when combating fire. Use waterfog to cool intact containers and nearby storage areas.

5.4 Hazchem code
None allocated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS. Clear area of all unprotected personnel. Contact emergency services where appropriate.

6.2 Environmental precautions
Prevent product from entering drains and waterways.

6.3 Methods of cleaning up
Contain spillage, then collect and place in suitable containers for reuse or disposal. Avoid generating dust.

6.4 Reference to other sections
See Sections 8 and 13 for exposure controls and disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

7.2 Conditions for safe storage, including any incompatibilities
Store in a cool, dry, well ventilated area, removed from incompatible substances and foodstuffs. Ensure containers are adequately labelled and tightly closed when not in use.

7.3 Specific end uses
No information provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters
Exposure standards

No exposure standards have been entered for this product.

Biological limits

No biological limit values have been entered for this product.

8.2 Exposure controls
Engineering controls Avoid inhalation. Use in well ventilated areas.

PPE

Eye / Face	Wear dust-proof goggles.
Hands	Wear PVC or rubber gloves.
Body	When using large quantities or where heavy contamination is likely, wear coveralls.
Respiratory	Wear a Class P1 (Particulate) respirator. Where an inhalation risk exists, wear a Class P1 (Particulate) respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	LIGHT BEIGE POWDER
Odour	SLIGHT ODOUR
Flammability	COMBUSTIBLE
Flash point	NOT RELEVANT
Boiling point	NOT AVAILABLE
Melting point	NOT AVAILABLE
Evaporation rate	NOT AVAILABLE
pH	NOT AVAILABLE
Vapour density	NOT AVAILABLE
Specific gravity	1.5
Solubility (water)	MISCIBLE
Vapour pressure	NOT AVAILABLE
Upper explosion limit	NOT RELEVANT
Lower explosion limit	NOT RELEVANT
Partition coefficient	NOT AVAILABLE
Autoignition temperature	NOT AVAILABLE
Decomposition temperature	NOT AVAILABLE
Viscosity	NOT AVAILABLE
Explosive properties	NOT AVAILABLE
Oxidising properties	NOT AVAILABLE
Odour threshold	NOT AVAILABLE

10. STABILITY AND REACTIVITY

10.1 Reactivity

Carefully review all information provided in sections 10.2 to 10.6.

10.2 Chemical stability

Stable under recommended conditions of storage.

10.3 Possibility of hazardous reactions

Polymerization is not expected to occur.

10.4 Conditions to avoid

Avoid heat, sparks, open flames and other ignition sources.

10.5 Incompatible materials

Incompatible with oxidising agents (e.g. hypochlorites) and acids (e.g. nitric acid).

10.6 Hazardous decomposition products

May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity	This product is expected to be of low acute toxicity. Under normal conditions of use, adverse health effects are not anticipated.
Skin	Not classified as a skin irritant. Contact may result in mild irritation.
Eye	Not classified as an eye irritant. Contact may cause discomfort, lacrimation and redness.
Sensitisation	Not classified as causing skin or respiratory sensitisation.
Mutagenicity	No evidence of mutagenic effects.
Carcinogenicity	No evidence of carcinogenic effects.
Reproductive	No relevant or reliable studies were identified.
STOT - single exposure	Not classified as causing organ damage from single exposure.
STOT - repeated exposure	Not classified as causing organ damage from repeated exposure.
Aspiration	This product does not present an aspiration hazard.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No information provided.

12.2 Persistence and degradability

No information provided.

12.3 Bioaccumulative potential

No information provided.

12.4 Mobility in soil

No information provided.

12.5 Other adverse effects

No information provided.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste disposal	Ensure product is covered with moist soil to prevent dust generation and dispose of to approved Council landfill. Contact the manufacturer/supplier for additional information (if required).
Legislation	Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD ACCORDING TO LAND TRANSPORT RULE: DANGEROUS GOODS 2005; NZS 5433:2012, UN, IMDG OR IATA

	LAND TRANSPORT (NZS 5433)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None allocated.	None allocated.	None allocated.
14.2 Proper Shipping Name	None allocated.	None allocated.	None allocated.
14.3 Transport hazard class	None allocated.	None allocated.	None allocated.
14.4 Packing Group	None allocated.	None allocated.	None allocated.

14.5 Environmental hazards

No information provided.

14.6 Special precautions for user

Hazchem code None allocated.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Approval code NON HAZARDOUS

Group standard NON HAZARDOUS

Inventory listings **NEW ZEALAND: NZIoC (New Zealand Inventory of Chemicals)**
All components are listed on the NZIoC inventory, or are exempt.

16. OTHER INFORMATION

Additional information

RESPIRATORS: In general the use of respirators should be limited and engineering controls employed to avoid exposure. If respiratory equipment must be worn ensure correct respirator selection and training is undertaken. Remember that some respirators may be extremely uncomfortable when used for long periods. The use of air powered or air supplied respirators should be considered where prolonged or repeated use is necessary.

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as form of product, method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: form of product; frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CCID	Chemical Classification and Information Database (HSNO)
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
EPA	Environmental Protection Authority [New Zealand]
GHS	Globally Harmonized System
HSNO	Hazardous Substances and New Organisms
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m³	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

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[End of SDS]

NEWPARK DRILLING FLUIDS

SAFETY DATA SHEET

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 Product identifier

Product name **BENTONITE POWDER**

Synonyms AVAGEL ● BENTONIL HR ● HISWELL ● MAXIGEL ● NATURALGEL ● NEWGEL ● RHEOBEN ● RHEOBEN NT ● SODIUM BENTONITE ● SODIUM MONTMORILLONITE

1.2 Uses and uses advised against

Uses DRILLING FLUID

1.3 Details of the supplier of the product

Supplier name **NEWPARK DRILLING FLUIDS (AUSTRALIA) LTD**

Address 11 Alacrity Place, Henderson, WA, 6166, AUSTRALIA

Telephone +61 8 9410 8200

Fax +61 8 9410 8299

Website www.newpark.com

1.4 Emergency telephone numbers

Emergency 1800 127 406 (Australia); +64 4 917 9888 (International)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

Physical Hazards

Not classified as a Physical Hazard

Health Hazards

Specific Target Organ Toxicity (Repeated Exposure): Category 2

Environmental Hazards

Not classified as an Environmental Hazard

2.2 GHS Label elements

Signal word **WARNING**

Pictograms

Hazard statements

H373 May cause damage to organs through prolonged or repeated exposure.

Prevention statements

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

Response statements

P314 Get medical advice/attention if you feel unwell.

Storage statements

None allocated.

Disposal statements

P501 Dispose of contents/container in accordance with relevant regulations.

2.3 Other hazards

No information provided.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

3.1 Substances / Mixtures

Ingredient	CAS Number	EC Number	Content
BENTONITE	1302-78-9	215-108-5	90 to 98%
QUARTZ (CRYSTALLINE SILICA)	14808-60-7	238-878-4	2 to 10%
SODA ASH	-	-	2 to 4%

4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes.

Inhalation If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.

Skin If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water.

Ingestion For advice, contact a Poisons Information Centre on 13 11 26 (Australia Wide) or a doctor (at once). Due to product form and application, ingestion is considered unlikely.

First aid facilities Eye wash facilities and safety shower should be available.

4.2 Most important symptoms and effects, both acute and delayed

Repeated exposure to crystalline silica may result in lung fibrosis (silicosis). Principal symptoms of silicosis are coughing and breathlessness. Crystalline silica is classified as carcinogenic to humans (IARC Group 1).

4.3 Immediate medical attention and special treatment needed

Treat symptomatically.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Use an extinguishing agent suitable for the surrounding fire.

5.2 Special hazards arising from the substance or mixture

Non flammable. May evolve toxic gases if strongly heated.

5.3 Advice for firefighters

Treat as per requirements for surrounding fires. Evacuate area and contact emergency services. Remain upwind and notify those downwind of hazard. Wear full protective equipment including Self Contained Breathing Apparatus (SCBA) when combating fire. Use waterfog to cool intact containers and nearby storage areas.

5.4 Hazchem code

None allocated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS.

6.2 Environmental precautions

Prevent product from entering drains and waterways.

6.3 Methods of cleaning up

Moisten with water to prevent a dust hazard and place in sealable containers for disposal.

6.4 Reference to other sections
See Sections 8 and 13 for exposure controls and disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

7.2 Conditions for safe storage, including any incompatibilities
Store in a cool, dry, well ventilated area, removed from incompatible substances and foodstuffs. Ensure packaging are adequately labelled, protected from physical damage and sealed when not in use. Check regularly for leaks or spills.

7.3 Specific end uses
No information provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters
Exposure standards

Ingredient	Reference	TWA		STEL	
		ppm	mg/m³	ppm	mg/m³
Quartz (respirable dust)	SWA [AUS]	--	0.05	--	--
Quartz (respirable dust)	WorkSafe VIC	--	0.05	--	--

Biological limits No Biological Limit Value allocated.

8.2 Exposure controls
Engineering controls Avoid inhalation. Use in well ventilated areas. Where an inhalation risk exists, mechanical extraction ventilation is recommended.

PPE

Eye / Face	Wear dust-proof goggles.
Hands	Wear PVC or rubber gloves.
Body	When using large quantities or where heavy contamination is likely, wear coveralls.
Respiratory	Where an inhalation risk exists, wear a Class P1 (Particulate) respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	BROWN POWDER
Odour	SLIGHT ODOUR
Flammability	NON FLAMMABLE
Flash point	NOT RELEVANT
Boiling point	NOT AVAILABLE
Melting point	1100°C to 1200°C (Fusion Point)
Evaporation rate	NOT AVAILABLE
pH	NOT AVAILABLE
Vapour density	NOT AVAILABLE
Specific gravity	2.7
Solubility (water)	INSOLUBLE
Vapour pressure	NOT AVAILABLE
Upper explosion limit	NOT RELEVANT
Lower explosion limit	NOT RELEVANT

9.1 Information on basic physical and chemical properties

Partition coefficient	NOT AVAILABLE
Autoignition temperature	NOT AVAILABLE
Decomposition temperature	NOT AVAILABLE
Viscosity	NOT AVAILABLE
Explosive properties	NOT EXPLOSIVE
Oxidising properties	NON OXIDISING
Odour threshold	NOT AVAILABLE

9.2 Other information

Bulk density	~ 0.9 kg/L

10. STABILITY AND REACTIVITY

10.1 Reactivity

Carefully review all information provided in sections 10.2 to 10.6.

10.2 Chemical stability

Stable under recommended conditions of storage.

10.3 Possibility of hazardous reactions

Polymerization is not expected to occur.

10.4 Conditions to avoid

Avoid heat, sparks, open flames and other ignition sources.

10.5 Incompatible materials

Incompatible with acids (e.g. nitric acid) and alkalis (e.g. sodium hydroxide).

10.6 Hazardous decomposition products

May evolve toxic gases if heated to decomposition.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Toxicity Data available for the ingredients:
QUARTZ (SILICA CRYSTALLINE) (14808-60-7):
LCLo (inhalation) = 300 ug/m³/10 years (human)
TCLo (inhalation) = 16 000 000 particles/ft3/8 hours/17.9 years (human-fibrosis)
BENTONITE (1302-78-9):
LD50 (intravenous) = 35 mg/kg (rat)
LD50 (oral): > 2000mg/kg (rat)
LDLo (intravenous) = 10 mg/kg (dog)
Inhalation LC 50: > 5.27 mg/L, 4hr (rat)

Additional ingredient toxicity values:

BENTONITE (1302-78-9)

LD50 (intravenous)	35 mg/kg (rat)
LDLo (intravenous)	10 mg/kg (dog)

Skin Not classified as a skin irritant. Contact may result in mild irritation and dermatitis.

Eye Not classified as an eye irritant. Contact may cause discomfort, lacrimation and redness.

Sensitisation Not classified as causing skin or respiratory sensitisation.

Mutagenicity Insufficient data available to classify as a mutagen.

Carcinogenicity This product contains crystalline silica which is classified as carcinogenic to humans (IARC Group 1). However, there is sufficient information to conclude that the relative risk of lung cancer is increased in persons with silicosis. Therefore, preventing the onset of silicosis will also reduce the cancer risk.

Reproductive Insufficient data available to classify as a reproductive toxin.

STOT - single exposure Not classified as causing organ damage from single exposure.

STOT - repeated exposure Repeated exposure to respirable silica may result in pulmonary fibrosis (silicosis). Silicosis is a fibronodular lung disease caused by deposition in the lungs of fine respirable particles of crystalline silica. Principal symptoms of silicosis are coughing and breathlessness.

Aspiration Not expected to present an aspiration hazard.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Bentonite (1302-78-9):
EC50 Daphnia > 100 mg/l, 48 hours
EC50 Freshwater algae > 100 mg/l, 72 hours
LC50 Freshwater fish = 16000 mg/l, 96 hours
LC50 Marine water fish = 2800 - 3200 mg/l, 24 hours
EC50 Coon stripe shrimp (Pandalus danae) = 24.8 mg/l, 96 hours
EC50 Dungeness or edible crab (Cancer magister) = 81.6 mg/l, 96 hours
LC50 Rainbow trout, donaldson trout (Oncorhynchus mykiss) = 19000 mg/l, 96 hours

12.2 Persistence and degradability

Not relevant for inorganic substances.

12.3 Bioaccumulative potential

Will not bioaccumulate.

12.4 Mobility in soil

Low water solubility, expected to sink and migrate into the sediment. Expected to partition to sediment and wastewater solids.

12.5 Other adverse effects

The main component/s of this product are not anticipated to cause any adverse effects to plants or animals.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste disposal Reuse where possible. No special precautions are normally required when handling this product.

Legislation Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None allocated.	None allocated.	None allocated.
14.2 Proper Shipping Name	None allocated.	None allocated.	None allocated.
14.3 Transport hazard class	None allocated.	None allocated.	None allocated.
14.4 Packing Group	None allocated.	None allocated.	None allocated.

14.5 Environmental hazards

No information provided.

14.6 Special precautions for user

Hazchem code None allocated.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Classifications Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

Inventory listings **AUSTRALIA: AIIC (Australian Inventory of Industrial Chemicals)**
All components are listed on AIIC, or are exempt.

16. OTHER INFORMATION

Additional information

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as form of product, method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: form of product; frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
GHS	Globally Harmonized System
GTEPG	Group Text Emergency Procedure Guide
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m³	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

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[End of SDS]

SDS no. D197
Version 4
Revision date 28-Jan-2019
Supersedes Date: 28-Oct-2015

Safety Data Sheet
AccuSET D197

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name AccuSET D197
Product code D197

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Silicic acid, sodium salt

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Silicic acid, sodium salt	215-687-4	1344-09-8	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Ensure adequate ventilation. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Store away from incompatibles, Metals Aluminum Copper alloys Copper Zinc

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established.

Component Information

Chemical Name	Arabic	Australia	Egypt
Silicic acid, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Silicic acid, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Silicic acid, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Silicic acid, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Silicic acid, sodium salt	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls

Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Break through time >480 minutes Glove thickness > 0.4 mm
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	11.44	
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.13	@20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	

Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	None known
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Contact with metals may evolve flammable hydrogen gas.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Metals. Aluminum. Copper. Copper alloys. Zinc.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Silicic acid, sodium salt	= 1960 mg/kg (Rat)	> 4640 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact. Inhalation.

Routes of entry None known.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Silicic acid, sodium salt	= 3185 mg/L LC50 Brachydanio rerio 96 h 301 - 478 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 216 mg/L EC50 Daphnia magna 96 h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated

IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Silicic acid, sodium salt
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	28-Oct-2015
Revision date	28-Jan-2019
Version	4
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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SDS no. D047
Version 3
Revision date 03-Mar-2021
Supersedes Date: 21-Feb-2016

Safety Data Sheet
Antifoam Agent D47

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Antifoam Agent D47
Product code D047

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Antifoam in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Seek medical attention if irritation occurs.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Harmful organic chemical fumes.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Avoid contact with: Strong acids Strong bases Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Repeated or prolonged contact Use protective gloves made of: Butyl Gloves-Neoprene, Nitrile Unless Specified Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces,

respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No data available	
pH @ dilution	No information available	
Melting / freezing point	< -35 °C / -31 °F	
Boiling point/range	No information available	
Flash point	229 °C / 444.2 °F	ASTM D-93
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	No information available	
Specific gravity	1	
Bulk density	No information available	
Relative density	1	@ 21.1°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	414 - 496 cst	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	<0°C/32°F
Molecular weight	No information available

VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

12.4 Mobility

Mobility
The product is insoluble and floats on water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	21-Feb-2016
Revision date	03-Mar-2021
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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SDS no. D175A
Version 4
Revision date 29-Apr-2020
Supersedes Date: 19-Jun-2015

Safety Data Sheet
Antifoam Agent D175A

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Antifoam Agent D175A
Product code D175A

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Non-crystalline silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Non-crystalline silica	Listed	Proprietary	1 - 5

Comments
No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Extinguish with carbon dioxide, dry chemical, foam or waterspray.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Solutions extremely slippery when spilled.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep at a temperature not exceeding 25 °C Store away from incompatibles, Strong oxidizing agents UV or Ionising Radiation. Steel

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Component Information

Chemical Name	Arabic	Australia	Egypt
Non-crystalline silica	Not determined	2mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Non-crystalline silica	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Non-crystalline silica	1 mg/m³ MAC 2 mg/m³ MAC	6.0 mg/m³ TWA	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Non-crystalline silica	Not determined	Not determined	3 mg/m³ STEL 6 mg/m³ STEL 1 mg/m³ TWA 2 mg/m³ TWA Fibrogenic substance also vitreous, in the form of disintegration aerosol 1177 Fibrogenic substance in the form of condensation aerosol, containing >=10% Silicon dioxide 1175, 1176
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Non-crystalline silica	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Butyl Rubber Break through time >480 minutes Glove thickness >0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapor/particulate Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Slight
Color	Milky white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	~ 5	
pH @ dilution	No information available	
Melting / freezing point	~ 0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	

Lower flammability limit	Not applicable	
Vapor pressure	2.3 kPa	@ 20 °C
Vapor density	No information available	
Specific gravity	~ 1	@ 25 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	~ 100 mPa s	@ 25 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents. UV or Ionising Radiation. Steel.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Non-crystalline silica	= 7900 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 2.2 mg/L (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Inhalation. Ingestion. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae. See component information below.

Toxicity to fish
This product is not considered toxic to fish. See component information below.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates. See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other

			aquatic invertebrates
Non-crystalline silica	= 5000 mg/L LC50 Brachydanio rerio 96 h	= 440 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 7600 mg/L EC50 Ceriodaphnia dubia 48 h

12.2 Persistence and degradability

The product is not expected to be biodegradable. See component information below.

Chemical Name	Persistence and degradability
Non-crystalline silica	No information available

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating. See component information below.

Chemical Name	Bioaccumulation
Non-crystalline silica	Not likely to bioaccumulate

12.4 Mobility

Mobility
Dispersible in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required

Group number Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	19-Jun-2015
Revision date	29-Apr-2020
Version	4
This SDS has been revised in the following section(s)	8, 11, 12, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D206
Version 4
Revision date 08-May-2018
Supersedes Date: 15-Aug-2014

Safety Data Sheet
Antifoaming Agent D206

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Antifoaming Agent D206
Product code D206

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Defoamer

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Dry chemical, CO_2, water spray or regular foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing. Do not eat, drink or smoke when using this product.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from freezing Store below 86F (30C). Incompatible with oxidizing agents. Incompatible with materials which react with water.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only. Coated (epoxy phenolic) steel drum or high density polyethylene (HDPE) can Stainless steel Plastic container

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes It is good practice to wear goggles when handling any chemical Tightly fitting safety goggles
Hand protection	Wear chemical resistant gloves such as nitrile or neoprene. Break through time >480 minutes Glove thickness 0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown)
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact. Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing

before re-use

8.2.3 Environmental exposure controls

Environmental exposure See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	None
Color	Milky white.
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	7-8	
pH @ dilution	No information available	
Melting / freezing point	~ 0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	2.3 kPa	@ 20 °C
Vapor density	No information available	
Specific gravity	1.0	@ 25 °C
Bulk density	No information available	
Relative density	0.97-1.01 kg/cm3	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	500-1100 mPa s (@ 20 °C)	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	2-4°C
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Stable under recommended storage conditions.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from freezing. Store below 86F (30C).

10.5 Incompatible materials

Strong oxidizing agents. Incompatible with materials which react with water.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information	Product does not present an acute toxicity hazard based on known or supplied information.
Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	None known.
Routes of entry	No route of entry noted.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	No hazard from product as supplied.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Unknown aquatic toxicity

12.2 Persistence and degradability

The product contains substances which are not expected to be biodegradable.

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	15-Aug-2014
Revision date	08-May-2018
Version	4
This SDS has been revised in the following section(s)	1, 7, 8, 9, 15, 16. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SDS no. D153
Version 3
Revision date 28-Mar-2018
Supersedes Date: 30-Jul-2015

Safety Data Sheet
Anti-Settling Agent D153

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Anti-Settling Agent D153
Product code D153

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Quartz, Crystalline silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Quartz, Crystalline silica	238-878-4	14808-60-7	60 - 100

Comments
IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn.

Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Carbon oxides (COx), React with hydrofluoric acid (HF) forming toxic gas (SiF4).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Material becomes slippery when wet. Use caution if wet. Avoid dust formation. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Product is slippery if wet. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Material becomes extremely slippery when wet. See Section 8.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture Avoid heat, flames and other sources of ignition. Avoid contact with: Hydrofluoric acid (HF) Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Quartz, Crystalline silica	0.1 mg/m^3 TWA	0.1mg/m^{3}TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Quartz, Crystalline silica	Not determined	0.1 mg/m^3 TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**

Quartz, Crystalline silica	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Quartz, Crystalline silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Quartz, Crystalline silica	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Neoprene gloves Nitrile
Break through time >0.4 minutes
Glove thickness >480 mm
Frequent change is advisable

Respiratory protection In case of inadequate ventilation wear respiratory protection Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact. Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Solid
Appearance Powder
Odor Odorless
Color White
Odor threshold Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	6-9	@20g/l
Melting / freezing point	No information available	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.65	
Bulk density	1100 - 1600 kg/m^3	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4). Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid dust formation. Take precautionary measures against static charges. Keep away from open flames, hot surfaces and sources of ignition.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause respiratory irritation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Quartz, Crystalline silica	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Quartz, Crystalline silica	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is insoluble and sinks in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	30-Jul-2015
Revision date	28-Mar-2018
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate

agreement between the parties.

SDS no. PID2443
Version 6
Revision date 26-Oct-2018
Supersedes Date: 02-Feb-2016

Safety Data Sheet
ASPHASOL* SUPREME

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name ASPHASOL* SUPREME
Product code PID2443
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale inhibitor. / Fluid loss reducer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	<3

3.2 Mixtures

Not applicable

Comments
The product contains other ingredients which do not contribute to the overall classification.
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Material becomes slippery when wet. Use caution if wet. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Suspended dust may present a dust explosion hazard Protect from moisture Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123,

			1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Neoprene Nitrile Frequent change is advisable

Respiratory protection — No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Mild Sulfur
Color	Gray - Black
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	7 - 10	@ 2%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	Not applicable	

Flammability (solid, gas)	Not applicable
Flammability Limit in Air	
Upper flammability limit	Not applicable
Lower flammability limit	Not applicable
Vapor pressure	No information available
Vapor density	No information available
Specific gravity	1.40 - 1.65
Bulk density	No information available
Relative density	No information available
Water solubility	Partly soluble
Solubility in other solvents	No information available
Autoignition temperature	190 °C / 374 °F
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

This product contains an ingredient that is classified, according to European regulations, as "harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment".
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae

This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Product is not biodegradable. See component information below.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Partly soluble. See component information below.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-Feb-2016
Revision date	26-Oct-2018
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID2049
Version 13
Revision date 17-Jan-2020
Supersedes Date: 05-Mar-2019

Safety Data Sheet
BARITE (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name BARITE (All Grades)
Product code PID2049

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Weighting agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Barite

Crystalline silica (impurity)

2.3 Other hazards

Thermal decomposition can lead to release of irritating gases and vapors
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Barite	236-664-5	13462-86-7	60 - 100
Crystalline silica (impurity)	238-878-4	14808-60-7	5 - <10

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid wet and humid conditions.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Barite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Barite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Barite	6 mg/m³ MAC	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Barite	Not determined	Not determined	6 mg/m³ TWA Fibrogenic substance 0242
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL

			1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Barite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene PVC Nitrile Frequent change is advisable

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Tan - Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	1580 °C / 2876 °F	
Boiling point/range	No information available	
Flash point	Not applicable	

Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	4.10 - 4.25	@ 20 °C
Bulk density	1920 - 2400 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid wet and humid conditions.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Respirable quartz <0.3% . Report number: N0600517.

Inhalation

Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact

Dust may cause mechanical irritation.

Skin contact

Prolonged contact may cause redness and irritation.

Ingestion

Ingestion may cause stomach discomfort.

Unknown acute toxicity

Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barite	> 15000 mg/kg (Rat)	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization

This product does not contain any components suspected to be sensitizing.

Mutagenic effects

This product does not contain any known or suspected mutagens.

Carcinogenicity

Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity

This product does not contain any known or suspected reproductive hazards.

Routes of Exposure

Inhalation.

Routes of entry

Inhalation.

Specific target organ toxicity - Single exposure

Not classified

Specific target organ toxicity - Repeated exposure

Not classified.

Aspiration hazard

Not applicable.

Other information

Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Barite	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Product is not biodegradable. See component information below.

Chemical Name	Persistence and degradability
Barite	Inorganic compound
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Barite	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Barite	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Barite	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

CAS Number 7727-43-7 can be used to identify the substance mentioned in Section 3 for the International Inventories.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	05-Mar-2019
Revision date	17-Jan-2020
Version	13
This SDS has been revised in the following section(s)	1, 3, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com

Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Follow general hygiene considerations recognized as common good workplace practices Do not handle until all safety precautions have been read and understood

HMIS classification

Health	1*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. D031
Version 3
Revision date 29-Aug-2018
Supersedes Date: 29-Jul-2015

Safety Data Sheet
BARITE 4,1 D31

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name BARITE 4,1 D31
Product code D031

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Weighting agent. Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	<5

3.2 Mixtures

Not applicable

Comments
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid generating or breathing dust. Take up mechanically and collect in suitable container for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid dust formation. Do not breathe dust. Avoid contact with skin and eyes.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Provide appropriate exhaust ventilation at places where dust is formed.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid extreme temperatures Store away from incompatibles, Hydrofluoric acid (HF) Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**

Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Rubber Nitrile Neoprene gloves Frequent change is advisable
Respiratory protection	Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Light tan - Light gray
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		

Upper flammability limit	Not applicable
Lower flammability limit	Not applicable
Vapor pressure	Not applicable
Vapor density	Not applicable
Specific gravity	4.1
Bulk density	No information available
Relative density	No information available
Water solubility	Insoluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid extreme temperatures. Avoid dust formation.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	29-Jul-2015
Revision date	29-Aug-2018
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. D020
Version 6
Revision date 11-Oct-2018
Supersedes Date: 19-Oct-2015

Safety Data Sheet
Bentonite Extender D20

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Bentonite Extender D20
Product code D020

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Product dust may be irritating to eyes, skin and respiratory system

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

3.2 Mixtures

Not applicable

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	1-5

Comments
Naturally occuring mineral.
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid wet and humid conditions.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Cream - Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	9-10	
pH @ dilution	No information available	
Melting / freezing point	> 450 °C / 842 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	

Specific gravity	2.3 - 2.6	20 °C
Bulk density	750 – 950 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 500 °C / 932°F	
Kinematic viscosity	Not applicable	
Dynamic viscosity	. Not applicable	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid wet and humid conditions. Avoid dust formation.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other

			aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	19-Oct-2015
Revision date	11-Oct-2018
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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SDS no. PID15482
Version 5
Revision date 28-Feb-2018
Supersedes Date: 04-Mar-2015

Safety Data Sheet
BENTONITE SPUD SYSTEM

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name BENTONITE SPUD SYSTEM
Product code PID15482

Synonyms BENTONITE SPUD SYSTEM (PUMP AND DUMP FORMULATION)

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Thermal decomposition can lead to release of irritating gases and vapors
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	<2

Comments
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123,

			1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Mild
Color	Light brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	

Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.67 - 2.04 g/cm³	@ 20°C.
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Inhalation Vapors may irritate throat and respiratory system.

Eye contact May cause slight irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	04-Mar-2015
Revision date	28-Feb-2018
Version	5
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID211
Version 10
Revision date 09-Feb-2019
Supersedes Date: 07-Jul-2018

Safety Data Sheet
BENTONITE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name BENTONITE
Product code PID211

Synonyms API BENTONITE, OCMA BENTONITE, WYOMING BENTONITE

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Product dust may be irritating to eyes, skin and respiratory system

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	1-5

3.2 Mixtures

Not applicable

Comments
Naturally occuring mineral.
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid wet and humid conditions.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123,

			1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Cream - Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	9-10	
Melting / freezing point	> 450 °C / 842 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	Not applicable	

Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.3 - 2.6	20 °C
Bulk density	750 – 950 kg/m³	
Relative density	No information available	
Water solubility	Negligible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 500 °C / 932°F	
Kinematic viscosity	Not applicable	
Dynamic viscosity	. Not applicable	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid wet and humid conditions. Avoid dust formation.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	07-Jul-2018
Revision date	09-Feb-2019
Version	10
This SDS has been revised in the following section(s)	2, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	E

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SDS no. PID11786
Version 7
Revision date 31-Jan-2018
Supersedes Date: 17-Dec-2015

Safety Data Sheet
CAL-Acid 50%

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name CAL-Acid 50%
Product code PID11786

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Scale dissolver

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1B

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse
P391 - Collect spillage

Contains
Formic acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Formic acid	200-579-1	64-18-6	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.
Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.

4. First Aid Measures

4.1 First aid measures

Inhalation Keep at rest. Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person. Immediate medical attention is required.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use water jet, Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG •2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Keep people away from and upwind of spill/leak. Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Avoid contact with: High temperatures. Oxidizing agents Bases Acids Amines Powdered metal Metals

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Formic acid	10 ppm STEL 19 mg/m³ STEL 5 ppm TWA 9.4 mg/m³ TWA	10ppmSTEL 19mg/m³STEL 5ppmTWA 9.4mg/m³TWA	10 ppm STEL 19 mg/m³ STEL 5 ppm TWA 9.4 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Formic acid	5 ppm TWA 9 mg/m³ TWA	5 ppm TWA Skin notation 10 ppm STEL 19 mg/m³ STEL	5 ppm OEL 9.4 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Formic acid	1 mg/m³ MAC	9.0 mg/m³ TWA 5.0 ppm TWA 10.0 ppm STEL	10 ppm STEL 19 mg/m³ STEL 5 ppm TWA 9.4 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Formic acid	5 ppm TWA 9.4 mg/m³ TWA	5 ppm TWA 9 mg/m³ TWA	Skin notation 1 mg/m³ MAC Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Formic acid	5 ppm TWA	9 mg/m³ TWA 18 mg/m³ STEL	5 ppm TWA 9 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Eye protection must conform to standard EN 166 Chemical splash goggles and/or face shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Butyl rubber
Break through time >480 minutes
Glove thickness 0.7 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with combination filter for vapour/particulate (EN 141) Type A/P3. At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Strong
Color	Light yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	2 - 3	
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	< 10 cPs	@ 20 °C
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	1.01 - 1.04 g/ml @ 25°C

Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive. Contact with metals may evolve flammable hydrogen gas.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
May release hydrogen gas (explosive) on contact with metals.

10.4 Conditions to avoid

Keep away from direct sunlight. High temperatures.

10.5 Incompatible materials

Oxidizing agents. Bases. Acids. Amines. Powdered metal. Metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapours are corrosive. After 24-36 hours, injured persons may develop serious shortness of breath and lung oedema. Vapours irritate the respiratory system, and may cause coughing and difficulties in breathing.

Eye contact Causes burns. May cause irreversible damage to eyes.

Skin contact Causes burns.

Ingestion Causes burns. Can burn mouth, throat, and stomach. Corrosive to the respiratory tract.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Formic acid	= 1100 mg/kg (Rat)	No data available	= 15 g/m³ (Rat) 15 min

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Eye contact. Ingestion. Inhalation.
Routes of entry	Skin contact. Eye contact. Ingestion. Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Formic acid	= 175 mg/L LC50 Lepomis macrochirus 24 h	= 26.9 mg/L EC50 Desmodesmus subspicatus 72 h = 25 mg/L EC50 Desmodesmus subspicatus 96 h	138 - 165.6 mg/L EC50 Daphnia magna 48 h = 120 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of as hazardous waste in compliance with local and national regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN3412
UN No. (IMDG/ANTAQ)	UN3412
UN No. (ICAO/ANAC)	UN3412

14.2. UN proper shipping name
FORMIC ACID,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	II
IMDG/ANTAQ Packing group	II
ICAO/ANAC Packing group	II

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	•2X
Tunnel restriction code	(E)
Hazchem code ADG	•2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Formic acid
Schedule 5

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002491 - Additives, Process Chemicals and Raw Materials (Corrosive) Group Standard 2017
Group number	8.2B

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Does not comply
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	17-Dec-2015
Revision date	31-Jan-2018
Version	7
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID12163
Version 7
Revision date 05-Jan-2018
Supersedes Date: 25-Jul-2014

Safety Data Sheet
CAL-Acid

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name CAL-Acid
Product code PID12163

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Scale dissolver

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1B

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse
P391 - Collect spillage

Contains
Formic acid

Citric acid monohydrate

Amines, tallow alkyl, ethoxylated

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Formic acid	200-579-1	64-18-6	10-30
Citric acid monohydrate	611-842-9	5949-29-1	1-<3
Amines, tallow alkyl, ethoxylated	500-153-8	61791-26-2	0.1-<1

Comments

The product contains other ingredients which do not contribute to the overall classification.
Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.

4. First Aid Measures

4.1 First aid measures

Inhalation Keep at rest. Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person. Immediate medical attention is required.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use water jet, Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards

Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Keep people away from and upwind of spill/leak. Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Avoid contact with: High temperatures. Oxidizing agents Bases Acids Amines Powdered metal Metals

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Formic acid	10 ppm STEL 19 mg/m³ STEL 5 ppm TWA 9.4 mg/m³ TWA	10ppmSTEL 19mg/m³STEL 5ppmTWA 9.4mg/m³TWA	10 ppm STEL 19 mg/m³ STEL 5 ppm TWA 9.4 mg/m³ TWA
Citric acid monohydrate	Not determined	Not determined	Not determined
Amines, tallow alkyl, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Formic acid	5 ppm TWA 9 mg/m³ TWA	5 ppm TWA Skin notation 10 ppm STEL 19 mg/m³ STEL	5 ppm OEL 9.4 mg/m³ OEL
Citric acid monohydrate	Not determined	Not determined	Not determined
Amines, tallow alkyl, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Formic acid	1 mg/m³ MAC	9.0 mg/m³ TWA 5.0 ppm TWA 10.0 ppm STEL	10 ppm STEL 19 mg/m³ STEL 5 ppm TWA 9.4 mg/m³ TWA
Citric acid monohydrate	Not determined	Not determined	Not determined
Amines, tallow alkyl, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Formic acid	5 ppm TWA 9.4 mg/m³ TWA	5 ppm TWA 9 mg/m³ TWA	Skin notation 1 mg/m³ MAC Skin
Citric acid monohydrate	Not determined	Not determined	Not determined
Amines, tallow alkyl, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Formic acid	5 ppm TWA	9 mg/m³ TWA 18 mg/m³ STEL	5 ppm TWA 9 mg/m³ TWA
Citric acid monohydrate	Not determined	Not determined	Not determined
Amines, tallow alkyl, ethoxylated	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Chemical splash goggles and/or face shield
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl rubber Break through time >480 minutes Glove thickness 0.7 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with combination filter for vapour/particulate (EN 141) Type A/P3. At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Strong
Color	Light amber
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	2.0	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	

Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	< 2 cPs	@ 20 °C
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	0°C / 32°F
Molecular weight	No information available
VOC content(%)	None
Density	1.06 - 1.08 g/ml @ 20°C

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive. Contact with metals may evolve flammable hydrogen gas.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
May release hydrogen gas (explosive) on contact with metals.

10.4 Conditions to avoid

Keep away from direct sunlight. High temperatures.

10.5 Incompatible materials

Oxidizing agents. Bases. Acids. Amines. Powdered metal. Metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Vapours are corrosive. After 24-36 hours, injured persons may develop serious shortness of breath and lung oedema. Vapours irritate the respiratory system, and may cause coughing and difficulties in breathing.
Eye contact	Causes burns. May cause irreversible damage to eyes.

Skin contact Causes burns.

Ingestion Causes burns. Can burn mouth, throat, and stomach. Corrosive to the respiratory tract.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Formic acid	= 1100 mg/kg (Rat)	No data available	= 15 g/m³ (Rat) 15 min
Citric acid monohydrate	No data available	No data available	No data available
Amines, tallow alkyl, ethoxylated	> 300 - 2000 mg/kg(Rat)	> 10 g/kg (Rat)	0.473 mg/l (Rat) dust/mist OECD 403

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact. Ingestion. Inhalation.

Routes of entry Skin contact. Eye contact. Ingestion. Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other

			aquatic invertebrates
Formic acid	= 175 mg/L LC50 Lepomis macrochirus 24 h	= 26.9 mg/L EC50 Desmodesmus subspicatus 72 h = 25 mg/L EC50 Desmodesmus subspicatus 96 h	138 - 165.6 mg/L EC50 Daphnia magna 48 h = 120 mg/L EC50 Daphnia magna 48 h
Citric acid monohydrate	= 1516 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 120 mg/L EC50 Daphnia magna 72 h
Amines, tallow alkyl, ethoxylated	1 - 10 mg/L LC50(Oncorhynchus mykiss) 96h	1- 10 mg/L EC50(Phaeodactylum tricornutum - Algae) 72h	1 - 10 mg/L EC50(Daphnia magna, Water flea) 48h

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of as hazardous waste in compliance with local and national regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN3412
UN No. (IMDG/ANTAQ)	UN3412
UN No. (ICAO/ANAC)	UN3412

14.2. UN proper shipping name
FORMIC ACID,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	II
IMDG/ANTAQ Packing group	II
ICAO/ANAC Packing group	II

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	•2X
Tunnel restriction code	(E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Formic acid
Schedule 5
Amines, tallow alkyl, ethoxylated
Schedule 5

New Zealand Hazard Classification Classified

HSNO approval no.	HSR002491 - Additives, Process Chemicals and Raw Materials (Corrosive) Group Standard 2017
Group number	8.2B

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Does not comply
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	25-Jul-2014
Revision date	05-Jan-2018
Version	7
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID2468
Version 9
Revision date 25-Jan-2019
Supersedes Date: 29-Dec-2015

Safety Data Sheet
CALCIUM BROMIDE BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name CALCIUM BROMIDE BRINE
Product code PID2468

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Clear-brine workover and completion fluid.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Calcium bromide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium bromide	232-164-6	7789-41-5	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Hydrogen bromide, Bromine.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Avoid contact with: Strong oxidizing agents Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium bromide	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium bromide	Not determined	Not determined	Not determined

Chemical Name	Kazakhstan	Kuwait	New Zealand
Calcium bromide	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium bromide	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium bromide	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Odorless
Color	Clear
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	< -7 °C / < 19.4 °F	
Boiling point/range	119 °C / 246.2 °F	760 mm Hg
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	2333 Pa	@ 20 °C
Vapor density	No information available	
Specific gravity	1.40 - 1.75	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	>700°C / > 1292°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Not applicable
Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged skin contact may cause skin irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium bromide	= 4100 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium bromide	No information available	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium bromide	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium bromide	Product/Substance is inorganic

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Calcium bromide	Easily soluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium bromide	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z. Proper Shipping Name: Drilling Brines (containing Calcium Bromide)

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Calcium bromide
Schedule 4

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	29-Dec-2015
Revision date	25-Jan-2019
Version	9
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	J

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SDS no. PID218
Version 9
Revision date 08-Feb-2021
Supersedes Date: 09-Jan-2017

Safety Data Sheet
CALCIUM CHLORIDE BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name CALCIUM CHLORIDE BRINE
Product code PID218

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Completion brine.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

_

Contains
Calcium chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium chloride	233-140-8	10043-52-4	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Chlorine, chlorine oxides, hydrogen chloride.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

Advice for emergency responders
Evacuate personnel to safe areas. Use non-slip safety shoes in areas where spills or leaks can occur. Wear respiratory protection. Keep people away from and upwind of spill/leak.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Strong reducing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium chloride	Not determined	Not determined	2 mg/m³ MAC (aerosol)
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium chloride	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Neoprene Nitrile rubber
Break through time >480 minutes
Glove thickness 0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type B/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	6.5 - 7.5	
pH @ dilution	No information available	
Melting / freezing point	-14 °C / 7 °F	
Boiling point/range	> 100 °C / >212 °F	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	9 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	1.01 - 1.41	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents. Strong reducing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium chloride	= 1000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact.

Routes of entry Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium chloride	= 10650 mg/L LC50 Lepomis macrochirus 96 h	No information available	2,400 mg/L EC50 (Daphnia magna) = 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium chloride	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium chloride	Inorganic compound

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Calcium chloride	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium chloride	After release, disperses through ground water

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Proper Shipping Name : Calcium Chloride Solution (less than 35%) Ship Type:- 3. Pollution Category:- Z.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	Calcium Chloride - HSR003389 Calcium chloride, >25% in a non hazardous diluent - HSR006565

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code) with amendments.MARPOL 73/78; Marine Environmental Protection Committee (MEPC) Circulars.

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	09-Jan-2017
Revision date	08-Feb-2021
Version	9
This SDS has been revised in the following section(s)	14. Transport information 15. Regulatory Information There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	J

Disclaimer

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SDS no. M002
Version 5
Revision date 08-Oct-2018
Supersedes Date: 25-Apr-2017

Safety Data Sheet
Caustic Soda M2

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Caustic Soda M2
Product code M002

CAS No 1310-73-2
EC No 215-185-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1A
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P406 - Store in corrosion resistant container with a resistant inner liner

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse
P390 - Absorb spillage to prevent material damage
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Sodium hydroxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Sodium hydroxide	215-185-5	1310-73-2	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Immediate medical attention is required.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas. The product reacts with water and will generate heat.

Hazardous combustion products
Thermal decomposition can lead to release of toxic and corrosive gases/vapors Sodium oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid dust formation. Do not breathe dust. Never add water directly to this product - may cause vigorous reaction/boiling. Always dilute by carefully pouring the product into the water.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store in original container. Protect from moisture High temperatures. Avoid contact with: Acids Water Oxidizing agents Metals Halogenated hydrocarbons Ammonium salts
Storage class	Corrosive storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium hydroxide	Not determined	2 mg/m³ Peak	2 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ Ceiling	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ TWA	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium hydroxide	2 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against dusts Chemical splash goggles and/or face shield

Hand protection
Wear gloves according to EN 374 to protect against skin effects from powders
Impervious gloves made of: Nitrile Rubber
Break through time >480 minutes
Glove thickness 0.35-0.4 mm
PVC Butyl rubber Break through time >480 minutes
Glove thickness >0.5 mm
Frequent change is advisable

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type B/P2 Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more

information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Flakes
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	>14	10 g/ 100ml
Melting / freezing point	323 °C / 613.4 °F	
Boiling point/range	1388 °C / 2530.4 °F	
Flash point		
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	0.1 kPa	@ 739 °C
Vapor density	>1 (air = 1)	
Specific gravity	2.1	@ 20 °C
Bulk density	1.1 - 2.13 g/cm³	
Relative density	2.1	@ 20°C.
Water solubility	Soluble in water 42g/ 100ml	
Solubility in other solvents	Ethanol Methanol	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	0.997 - 2.228 mPa.s	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	Not applicable

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive to Metals. Contact with metals may evolve flammable hydrogen gas. Reacts violently with water.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. High temperatures.

10.5 Incompatible materials

Acids. Metals. Water. Oxidizing agents. Halogenated hydrocarbons. Ammonium salts.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Contact with moist mucous membranes of the respiratory system can cause caustic condition resulting in burns. Inhaled corrosive substances can lead to a toxic edema of the lungs.

Eye contact Causes serious eye damage.

Skin contact Causes severe skin burns.

Ingestion Ingestion causes burns of the upper digestive and respiratory tracts.

Unknown acute toxicity Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	No data available	1350 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact. Inhalation. Ingestion.

Routes of entry Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Sodium hydroxide	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Sodium hydroxide	Product/Substance is inorganic

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
Sodium hydroxide	Soluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Sodium hydroxide	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1823
UN No. (IMDG/ANTAQ)	UN1823
UN No. (ICAO/ANAC)	UN1823

14.2. UN proper shipping name

SODIUM HYDROXIDE, SOLID,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	II
IMDG/ANTAQ Packing group	II
ICAO/ANAC Packing group	II

14.5 Environmental hazard

No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2W
Tunnel restriction code	(E)

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium hydroxide
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	25-Apr-2017
Revision date	08-Oct-2018
Version	5
This SDS has been revised in the following section(s)	1, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	0
Physical hazard	1
PPE	X

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SDS no. D901
Version 6
Revision date 08-Jun-2021
Supersedes Date: 13-Apr-2016

Safety Data Sheet
Cement Class A D901

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Cement Class A D901
Product code D901

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1B
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary statements
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P272 - Contaminated work clothing should not be allowed out of the workplace
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Portland cement

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Portland cement	266-043-4	65997-15-1	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors React with hydrofluoric acid (HF) forming toxic gas (SiF4).

5.3 Advice for firefighters

Special protective equipment for fire-fighters

As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid contact with the skin and the eyes. Avoid dust formation. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Pick up and transfer to properly labeled containers. Keep in suitable, closed containers for disposal. Clean contaminated surface thoroughly. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Persons susceptible to allergic reactions should not handle this product. May produce an allergic reaction.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Provide appropriate exhaust ventilation at places where dust is formed.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Oxidizing agents Strong acids Aluminum Hydrofluoric acid (HF)
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Chemical Name	Arabic	Australia	Egypt
Portland cement	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Portland cement	10 mg/m³ TWA	10 mg/m³ TWA	4 mg/m³ OEL 1 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Portland cement	Not determined	10.0 mg/m³ TWA 5.0 mg/m³ TWA	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Portland cement	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Portland cement	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: PVC disposable gloves Rubber gloves Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Gray or White

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	11 - 13	@10% sol
Melting / freezing point	> 1250 °C / 2282 °F	
Boiling point/range	No information available	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	Not applicable	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	No information available	
Relative Vapor Density	No information available	
Specific gravity	No information available	
Bulk density	0.9 - 1.5 g/cm³	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	2.75 - 3.20	
Explosive properties	Not applicable	
Oxidizing properties	Not applicable	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid dust formation. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Oxidizing agents. Hydrofluoric acid (HF). Strong acids. Aluminium.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Contact with moist mucous membranes of the respiratory system can cause caustic condition resulting in burns.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation. May cause an allergic skin reaction.

Ingestion Ingestion may cause irritation to mucous membranes.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Portland cement	No data available	No data available	No data available

Sensitization May cause allergic skin reaction.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Inhalation. Eye contact.

Routes of entry Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Portland cement	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Slightly soluble in water.

Mobility in soil
No information available.

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Portland cement
Schedule 4
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA) Complies

Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	13-Apr-2016
Revision date	08-Jun-2021
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D907
Version 5
Revision date 01-Aug-2018
Supersedes Date: 05-Mar-2014

Safety Data Sheet
Cement Class G D907

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Cement Class G D907
Product code D907
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Sub-Category 1B
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P362 - Take off contaminated clothing and wash before reuse
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Portland Cement Clinker

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Portland Cement Clinker	266-043-4	65997-15-1	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors React with hydrofluoric acid (HF) forming toxic gas (SiF4).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Avoid dust formation. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Avoid contact with the skin and the eyes.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Pick up and transfer to properly labeled containers. Keep in suitable, closed containers for disposal. Clean contaminated surface thoroughly. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not breathe vapors/dust. Avoid contact with skin and eyes. Avoid handling causing generation of dust. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Store away from incompatibles, Powdered aluminum Acids Oxidizing agents Hydrofluoric acid (HF)

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Portland Cement Clinker	10 mg/m³ TWA	10 mg/m³ TWA	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Portland Cement Clinker	10 mg/m³ TWA	10 mg/m³ TWA	4 mg/m³ OEL 1 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Portland Cement Clinker	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Portland Cement Clinker	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Portland Cement Clinker	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: PVC disposable gloves Rubber gloves Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Effective dust mask. Type P2/P3 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Gray or White
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	11 - 13	@10% sol
Melting / freezing point	> 1250 °C / 2282 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	~ 3	
Bulk density	0.9 - 1.5 g/cm³	
Relative density	2.75 - 3.20	
Water solubility	0.1-1.5 g/L @ 20 °C	
Solubility in other solvents	No information available	
Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	Not applicable

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	Not applicable
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Acids. Powdered aluminum. Strong oxidizing agents. Hydrofluoric acid (HF).

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Contact with moist mucous membranes of the respiratory system can cause caustic condition resulting in burns.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation. May cause an allergic skin reaction.

Ingestion Ingestion may cause irritation to mucous membranes.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Portland Cement Clinker	No data available	No data available	No data available

Sensitization May cause allergic skin reaction.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Inhalation. Eye contact.

Routes of entry Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Not classified.

Repeated exposure

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Portland Cement Clinker	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Portland Cement Clinker	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Portland Cement Clinker	Product/Substance is inorganic

12.4 Mobility

Mobility
Slightly soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Portland Cement Clinker
Schedule 4
Schedule 6
Schedule 5

New Zealand Hazard Classification	Classified
HSNO approval no.	6.5B, 6.3A, 8.3A
Group number	HSR002544

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	05-Mar-2014
Revision date	01-Aug-2018
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3 *
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D080
Version 4
Revision date 10-Feb-2021
Supersedes Date: 22-Jan-2016

Safety Data Sheet
Cement Liquid Dispersant D80

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Cement Liquid Dispersant D80
Product code D080

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards

Chronic aquatic toxicity	Category 2

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
H411 - Toxic to aquatic life with long lasting effects

Precautionary statements
P273 - Avoid release to the environment
P391 - Collect spillage
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

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Contains
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.
Classified as Hazardous according to the criteria of NOHSC.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	Polymer	9008-63-3	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 3Z

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Do not eat, drink or smoke when using this product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Do not freeze Store above 0°C Avoid contact with: Oxidizing agents Acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established.

Component Information

Chemical Name	Arabic	Australia	Egypt
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	Not determined	Not determined	Not determined

Chemical Name	Kazakhstan	Kuwait	New Zealand
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation, especially in confined areas

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Wear chemical resistant gloves such as nitrile or neoprene.
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance Opaque
Odor Pungent

Color	Dark brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	6 - 8	
pH @ dilution	No information available	
Melting / freezing point	- 2 °C/ 28 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	> 1 (air = 1)	
Specific gravity	1.2 g/cm^3	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	60 mPa s	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Do not freeze. Store above 0°C.

10.5 Incompatible materials

Oxidizing agents. Acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Toxic to aquatic life with long lasting effects

Toxicity to algae
EC50 1.46 mg/l Skeletonema Costatum 48 h.

Toxicity to fish
Not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
LC50 > 100 mg/l Acartia tonsa 48 h.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde	No information available	No information available	No information available

12.2 Persistence and degradability

Product is not biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN3082
UN No. (IMDG/ANTAQ) UN3082
UN No. (ICAO/ANAC) UN3082

14.2. UN proper shipping name
ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Sodium polynaphthalene sulfonate)

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class 9
IMDG/ANTAQ Hazard class 9
ICAO/ANAC Hazard class/division 9

14.4 Packing group
ADR/RID/ADN/ADG Packing group III
IMDG/ANTAQ Packing group III
ICAO/ANAC Packing group III

14.5 Environmental hazard
Yes

14.6 Special precautions
Hazard identification no (ADR) 90
EmS (IMDG) F-A, S-F
Emergency Action Code (EAC) 3Z
Tunnel restriction code (-)
Hazchem code ADG 3Z

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Construction Products (Subsidiary Hazard) Group Standard 2020
HSNO approval no.	HSR002544
Group number	9.1B

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	22-Jan-2016
Revision date	10-Feb-2021
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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SDS no. D110
Version 4
Revision date 10-Sep-2019
Supersedes Date: 06-Jun-2018

Safety Data Sheet
Cement Retarder D110

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Cement Retarder D110
Product code D110

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium chloride (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium chloride (impurity)	231-598-3	7647-14-5	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Do not freeze Store above 0°C Store away from incompatibles, Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium chloride (impurity)	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium chloride (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium chloride (impurity)	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium chloride (impurity)	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium chloride (impurity)	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Rubber Break through time >480 minutes Glove thickness 0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 In case of insufficient ventilation, wear suitable respiratory equipment
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Opaque
Odor	Sweet
Color	Brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	6 - 9	
pH @ dilution	No information available	
Melting / freezing point	-4 °C / 24.8 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.13	
Bulk density	No information available	
Relative density	1.128 - 1.144	@ 25°C.
Water solubility	Soluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	>242°C / >467.6 °F	

Kinematic viscosity	No information available	
Dynamic viscosity	1.5cst	@ 40 °C
log Pow	Does not bioaccumulate	

Explosive properties	None known
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Do not freeze. Store above 0°C.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium chloride (impurity)	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium chloride (impurity)	4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Does not comply

Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	06-Jun-2018
Revision date	10-Sep-2019
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D178
Version 4
Revision date 03-Oct-2019
Supersedes Date: 26-Jun-2019

Safety Data Sheet
CemPLUS Geo D178

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name CemPLUS Geo D178
Product code D178

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H350 - May cause cancer if inhaled
H372 - Causes damage to organs through prolonged or repeated exposure

Precautionary statements
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P201 - Obtain special instructions before use
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product

Contains
Quartz, Crystalline silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Quartz, Crystalline silica	238-878-4	14808-60-7	60-100
Respirable Crystalline Silica (Quartz)	238-878-4	14808-60-7	>10

3.2 Mixtures

Not applicable

Comments
IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation

develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
React with hydrofluoric acid (HF) forming toxic gas (SiF4).

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. For personal protection see section 8.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store away from incompatibles, React with hydrofluoric acid (HF) forming toxic gas (SiF4) Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Quartz, Crystalline silica	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**

Quartz, Crystalline silica	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Quartz, Crystalline silica	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Quartz, Crystalline silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Quartz, Crystalline silica	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Provide appropriate exhaust ventilation at places where dust is formed Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Neoprene Nitrile Rubber Frequent change is advisable

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Solid
Appearance — Powder
Odor — Odorless
Color — Tan or White
Odor threshold — Not applicable

Property	Values	Remarks
pH	No information available	

pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	1100 -1600 kg/m^3	
Relative density	2.5-2.7	@ 20°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause respiratory irritation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Quartz, Crystalline silica	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 1.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that

large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Quartz, Crystalline silica	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Quartz, Crystalline silica	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Quartz, Crystalline silica	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Quartz, Crystalline silica	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Quartz, Crystalline silica	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not applicable

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Classified

HSNO approval no. HSR003125

Group number	6.7A, 6.9A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	26-Jun-2019
Revision date	03-Oct-2019
Version	4
This SDS has been revised in the following section(s)	9. Physical and chemical properties No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*

Flammability	0
Physical hazard	0
PPE	E

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SDS no. U042
Version 6
Revision date 10-Aug-2018
Supersedes Date: 28-Jul-2016

Safety Data Sheet
Chelating Agent U42

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Chelating Agent U42
Product code U042

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Iron control agent in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Croatia	01-23-48-342(for medical information) -Center for Poison

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves and eye/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P280 - Wear protective gloves
P280 - Wear eye protection/ face protection
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P210 - Keep away from heat. - No smoking
P314 - Get medical advice/attention if you feel unwell
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse

Contains
Tetrasodium ethylenediaminetetraacetate

Sodium hydroxide

Trisodium nitrilotriacetate (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Tetrasodium ethylenediaminetetraacetate	200-573-9	64-02-8	30 - 60
Sodium hydroxide	215-185-5	1310-73-2	<=1
Trisodium nitrilotriacetate (impurity)	225-768-6	5064-31-3	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Get immediate medical attention. Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray or fog is preferred; if water not available use dry chemical, CO_2 or regular foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Heating or fire can release toxic gas Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or

spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store at ambient conditions Store away from incompatibles, Zinc Aluminum Copper Copper alloys Nickel Steel Oxidizing agents

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Tetrasodium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Sodium hydroxide	Not determined	2 mg/m³ Peak	2 mg/m³ Ceiling
Trisodium nitrilotriacetate (impurity)	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Tetrasodium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ Ceiling	Not determined
Trisodium nitrilotriacetate (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Tetrasodium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Sodium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Trisodium nitrilotriacetate (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Tetrasodium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ TWA	Not determined
Trisodium nitrilotriacetate (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Tetrasodium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Sodium hydroxide	2 mg/m³ TWA	Not determined	Not determined
Trisodium nitrilotriacetate (impurity)	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Chemical splash goggles and/or face shield Eye protection must conform to standard EN 166
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Use protective gloves made of: Butyl rubber Break through time >30 minutes Glove thickness 0.7 mm or Nitrile rubber Glove thickness >30 mm Break through time 0.4 minutes Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight Ammoniacal
Color	Yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	12	(@1%w/w)
Melting / freezing point	-31 °C / -24 °F	
Boiling point/range	106 °C / 223 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.3	25 °C
Bulk density	No information available	
Relative density	1.31	@ 25°C.

Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	10 cSt @ 20 °C
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Store at ambient conditions.

10.5 Incompatible materials

Zinc. Aluminum. Copper. Copper alloys. Nickel. Steel. Incompatible with oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Harmful by inhalation. Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. May cause damage to organs through prolonged or repeated exposure.
Eye contact	Causes serious eye damage. May cause irreversible damage to eyes.

Skin contact Causes skin irritation. Prolonged skin contact may cause burns.

Ingestion Ingestion may cause irritation to mucous membranes. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrasodium ethylenediaminetetraacetate	= 10,000 mg/kg (Rat)	No data available	No data available
Sodium hydroxide	No data available	1350 mg/kg (Rabbit)	No data available
Trisodium nitrilotriacetate (impurity)	= 1100 mg/kg (Rat)	No data available	> 5 mg/L (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Skin contact. Eye contact. Ingestion.

Routes of entry Ingestion. Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Tetrasodium ethylenediaminetetraacetate	= 59.8 mg/L LC50 Pimephales promelas 96 h = 41 mg/L LC50 Lepomis macrochirus 96 h	= 1.01 mg/L EC50 Desmodesmus subspicatus 72 h	= 610 mg/L EC50 Daphnia magna 24 h
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available
Trisodium nitrilotriacetate (impurity)	= 114 mg/L LC50 Pimephales promelas 96 h 560 - 1000 mg/L LC50 Poecilia reticulata 96 h 72 - 133 mg/L LC50 Oncorhynchus mykiss 96 h 560 - 1000 mg/L LC50 Oryzias latipes 96 h = 470 mg/L LC50 Pimephales promelas 96 h = 252 mg/L LC50 Lepomis macrochirus 96 h 93 - 170 mg/L LC50 Pimephales promelas 96 h 175 - 225 mg/L LC50 Lepomis macrochirus 96 h	560 - 1000 mg/L EC50 Chlorella vulgaris 96 h	560 - 1000 mg/L LC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not readily biodegradable.

Chemical Name	Persistence and degradability
Tetrasodium ethylenediaminetetraacetate	Not readily biodegradable
Sodium hydroxide	Inorganic compound
Trisodium nitrilotriacetate (impurity)	Readily biodegradable

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

Chemical Name	Bioaccumulation
Tetrasodium ethylenediaminetetraacetate	No bioaccumulation potential
Sodium hydroxide	No bioaccumulation potential
Trisodium nitrilotriacetate (impurity)	Not likely to bioaccumulate

log Pow
<3

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Chemical Name	Mobility
Tetrasodium ethylenediaminetetraacetate	Soluble in water
Sodium hydroxide	Easily soluble
Trisodium nitrilotriacetate (impurity)	Soluble in water

Mobility in soil
Not expected to adsorb on soil.

Chemical Name	Mobility in soil

Tetrasodium ethylenediaminetetraacetate	Henry's Law Constant : 1.19E-18 Pa*m3/mol @ 25°C
Sodium hydroxide	Not expected to adsorb on soil
Trisodium nitrilotriacetate (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN3267
UN No. (IMDG/ANTAQ) UN3267
UN No. (ICAO/ANAC) UN3267

14.2. UN proper shipping name

CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S. (contains sodium hydroxide), tetrasodium ethylenediaminetetra acetic acid),

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class 8
IMDG/ANTAQ Hazard class 8
ICAO/ANAC Hazard class/division 8

14.4 Packing group

ADR/RID/ADN/ADG Packing group III
IMDG/ANTAQ Packing group III
ICAO/ANAC Packing group III

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2X
Tunnel restriction code	(E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium hydroxide
Schedule 6
Schedule 5
Trisodium nitrilotriacetate (impurity)
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland

Supersedes Date:	28-Jul-2016
Revision date	10-Aug-2018
Version	6
This SDS has been revised in the following section(s)	The following sections have been revised: 2, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	1
Physical hazard	0
PPE	X

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SDS no. D079
Version 3
Revision date 08-Oct-2018
Supersedes Date: 22-Jan-2015

Safety Data Sheet
Chemical Extender D79

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Chemical Extender D79
Product code D079

CAS No 6834-92-0
EC No 229-912-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 B
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves and eye/face protection
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P310 - Immediately call a POISON CENTER or doctor/physician
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

Contains
Disodium metasilicate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Disodium metasilicate	229-912-9	6834-92-0	60 - 100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Avoid dust formation. Do not breathe dust. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Prevent dust cloud. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid dust formation. Do not breathe dust.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Protect from moisture Store away from incompatibles, See Section 10
Storage class	Corrosive storage.
Packaging materials	Use specially constructed containers only.

Packaging materials to be avoided Aluminium

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values

Chemical Name	Arabic	Australia	Egypt
Disodium metasilicate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Disodium metasilicate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Disodium metasilicate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Disodium metasilicate	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Disodium metasilicate	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation, especially in confined areas

Personal protective equipment

Eye protection Tightly fitting safety goggles Face-shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Repeated or prolonged contact Impervious gloves made of: PVC or Nitrile rubber
Always ensure that gloves are free from defects and that they are stored and used correctly
Frequent change is advisable

Respiratory protection Use only with adequate ventilation Effective dust mask. P2

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Crystals
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	12.6	
pH @ dilution	10 g/l	
Melting / freezing point	1088 °C / 1990 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.4 g/mL	@22 °C
Bulk density	No information available	
Relative density	2.4	@ 22°C.
Water solubility	Soluble in water 270 g/L @ 30 °C	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Does not bioaccumulate	

Explosive properties	None
Oxidizing properties	None

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive to aluminum when wet. Gives off hydrogen by reaction with metals. Reacts violently with acids.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Excessive heat. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Aluminum. Metals. Alkalis. Strong acids. Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation May cause respiratory irritation.

Eye contact Causes burns. Causes serious eye damage.

Skin contact Causes severe skin burns.

Ingestion Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Disodium metasilicate	= 1153 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Inhalation. Eye contact.

Routes of entry Skin contact. Inhalation. Eye contact.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Disodium metasilicate	= 210 mg/L LC50 Brachydanio rerio 96 h	No information available	= 216 mg/L EC50 Daphnia magna 96 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN3253
UN No. (IMDG/ANTAQ) UN3253
UN No. (ICAO/ANAC) UN3253

14.2. UN proper shipping name
DISODIUM TRIOXOSILICATE,

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class 8
IMDG/ANTAQ Hazard class 8
ICAO/ANAC Hazard class/division 8

14.4 Packing group
ADR/RID/ADN/ADG Packing group PG III
IMDG/ANTAQ Packing group PG III
ICAO/ANAC Packing group PG III

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
Hazard identification no (ADR) 80
EmS (IMDG) F-A, S-B
Emergency Action Code (EAC) 2X
Tunnel restriction code E

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	22-Jan-2015
Revision date	08-Oct-2018
Version	3
This SDS has been revised in the following section(s)	1, 5, 7, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	0
Physical hazard	4
PPE	X

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SDS no. D956
Version 5
Revision date 27-Jul-2018
Supersedes Date: 04-Aug-2016

Safety Data Sheet
Class G - Silica Blend D956

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Class G - Silica Blend D956
Product code D956

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1B
Specific target organ toxicity - Single exposure	Category 3
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Portland cement

Quartz, Crystalline silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Portland cement	266-043-4	65997-15-1	60 - 80
Quartz, Crystalline silica	238-878-4	14808-60-7	10-30

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards

None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors React with hydrofluoric acid (HF) forming toxic gas (SiF4).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Avoid dust formation. Do not breathe dust. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Prevent dust cloud. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Pick up and transfer to properly labeled containers. Keep in suitable, closed containers for disposal. Clean contaminated surface thoroughly. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not breathe vapors/dust. Avoid contact with skin and eyes. Avoid handling causing generation of dust. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Do not eat, drink or smoke when using this product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Store away from incompatibles, Powdered aluminum Oxidizing agents Hydrofluoric acid (HF) Strong bases Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Component Information

Chemical Name	**Arabic**	**Australia**	**Egypt**
Portland cement	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Quartz, Crystalline silica	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Portland cement	10 mg/m³ TWA	10 mg/m³ TWA	4 mg/m³ OEL 1 mg/m³ OEL
Quartz, Crystalline silica	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Portland cement	Not determined	Not determined	10 mg/m³ TWA
Quartz, Crystalline silica	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Portland cement	10 mg/m³ TWA	Not determined	Not determined
Quartz, Crystalline silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Portland cement	Not determined	Not determined	Not determined
Quartz, Crystalline silica	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Butyl Neoprene Nitrile Rubber Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	11.0 - 13.5	
Melting / freezing point	> 1250 °C/ 2282 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	2.75-3.20	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity		
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture.

10.5 Incompatible materials

Powdered aluminum. Strong oxidizing agents. Hydrofluoric acid (HF). Strong acids. Strong bases.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause respiratory irritation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation. Contact with moist skin may cause skin burns. May cause an allergic skin reaction.

Ingestion Ingestion may cause irritation to mucous membranes.

Unknown acute toxicity Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Portland cement	No data available	No data available	No data available
Quartz, Crystalline silica	= 500 mg/kg (Rat)	No data available	No data available

Sensitization May cause allergic skin reaction.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Ingestion. Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation. Ingestion.
Specific target organ toxicity - Single exposure	Category 3
Specific target organ toxicity - Repeated exposure	Category 2.
Target organ effects	Respiratory system. Lungs.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Portland cement	No information available	No information available	No information available
Quartz, Crystalline silica	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available.

Chemical Name	Persistence and degradability
Quartz, Crystalline silica	Inorganic compound

12.3 Bioaccumulative potential

No product level data available.

Chemical Name	Bioaccumulation
Quartz, Crystalline silica	Product/Substance is inorganic

12.4 Mobility

Mobility
Slightly soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Portland cement
Schedule 4
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel

Supersedes Date: 04-Aug-2016

Revision date	27-Jul-2018
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	1
Physical hazard	0
PPE	C

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SDS no. D282
Version 1
Revision date 02-Mar-2021
Supersedes Date: None

Safety Data Sheet
CO2 Swellable Particles D282

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name CO2 Swellable Particles D282
Product code D282

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P273 - Avoid release to the environment
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

_

Contains
2,6-di-tert-butyl-p-cresol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2,6-di-tert-butyl-p-cresol	204-881-4	128-37-0	1-<3

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Fire or high temperatures create: Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke), Hydrogen cyanide (hydrocyanic acid).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
2,6-di-tert-butyl-p-cresol	10 mg/m³ TWA	10mg/m³TWA	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
2,6-di-tert-butyl-p-cresol	Not determined	10 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2,6-di-tert-butyl-p-cresol	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2,6-di-tert-butyl-p-cresol	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2,6-di-tert-butyl-p-cresol	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will

vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Neoprene Nitrile Butyl Rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.0	@ 25°C.
Water solubility	Insoluble	
Solubility in other solvents	Partly soluble Ketone Aromatic solvents	
Autoignition temperature	No information available	

Decomposition temperature	> 200 ◦C/ 392 ◦F
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,6-di-tert-butyl-p-cresol	> 2930 mg/kg (Rat)	> 2000 mg/kg (Rat)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,6-di-tert-butyl-p-cresol	= 5 mg/L LC50 Oryzias latipes 48 h	> 0.42 mg/L EC50 Desmodesmus subspicatus 72 h = 6 mg/L EC50 Pseudokirchneriella subcapitata 72 h	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
2,6-di-tert-butyl-p-cresol	Not readily biodegradable

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated

ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Revision date	02-Mar-2021

Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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Safety Data Sheet
CONQOR* 303A

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name CONQOR* 303A
Product code PID402

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Corrosion inhibitor

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Water	231-791-2	7732-18-5	60-100
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	272-712-1	68909-77-3	30-60

Comments
Based on test data – Skin corrosion/irritation (OECD 404 Skin Rabbit), this product is not corrosive or irritant.
Based on test data – Serious eye damage/irritation (EPA OPPTS: 870.2400 Eye Rabbit), this product is irritant.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid frost. Store at room temperature Avoid contact with: Acids Nitrites
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Neoprene PVC Nitrile rubber
Break through time >480 minutes
Glove thickness 0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing and gloves, including the inside, before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight
Color	Dark amber
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Approximately 11.5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	151.6 °C / 305 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.10	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	4 cP	@ 25 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	< -12°C / 11°F)
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Store at room temperature. Avoid frost.

10.5 Incompatible materials

Acids. Do not add nitrites or other nitrosating agents to this product. May cause formation of nitrosamine.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	5000 mg/kg (Rat)	>2000 mg/kg (Rat)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact.

Routes of entry None known.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	OECD; Acute LC50; 96 hours Semi-static; Fish > 45 g/l	OECD; Acute ErC50 (growth rate); 72 hours Static; Algae; 45 mg/kg OECD 201 Algae, Growth Inhibitor Test; Chronic NOECr; 72 hours Static; Algae; 3.2 mg/l	OECD; Acute EC50; 48 hours Static, Daphnia; > 100 g/l

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

No bioaccumulation expected due to high molecular weight.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

New Zealand Hazard Classification Classified

HSNO approval no. HSR003599

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 24-Feb-2017

Revision date 14-Nov-2018

Version 13

This SDS has been revised in the following section(s) 1, 2, 7, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D095
Version 5
Revision date 30-May-2018
Supersedes Date: 09-May-2016

Safety Data Sheet
D095 Cement Additive

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D095 Cement Additive
Product code D095

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Thermal decomposition can lead to release of irritating gases and vapors

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures Not applicable

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment identified in Section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid generating or breathing dust. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid dust formation
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Use protective gloves made of: PVC Neoprene Nitrile Rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Effective dust mask. Type P1 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Fibers
Odor	None
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	> 500 °C / 932 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.6	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	None known
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.
Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Not applicable.

12.3 Bioaccumulative potential

Not applicable.

12.4 Mobility

Mobility
The product is insoluble and sinks in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

International inventories

USA (TSCA)	Does not comply
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Does not comply
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	09-May-2016
Revision date	30-May-2018
Version	5
This SDS has been revised in the following section(s)	1, 7, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D600G
Version 4
Revision date 26-Apr-2021
Supersedes Date: 15-Jul-2016

Safety Data Sheet
D600G GASBLOK* Gas Migration Control Additive

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D600G GASBLOK* Gas Migration Control Additive
Product code D600G

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Gas control agent Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

–

Contains
C12-15 alcohol ethyoxylated

Sodium dodecyl sulphate

1,4-Dioxane (Impurity)

5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
C12-15 alcohol ethyoxylated	500-195-7	68131-39-5	1-<5
Sodium dodecyl sulphate	205-788-1	151-21-3	>= 0.1 - <0.3
1,4-Dioxane (Impurity)	204-661-8	123-91-1	<=0.1
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	mixture	55965-84-9	< 0.0015

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
High volume water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Heating of containers may cause pressure rise, with risk of bursting.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sulphur oxides, Sodium oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Repeated or prolonged contact may cause allergic reactions in very susceptible persons. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store away from heat and sources of ignition Avoid frost. Incompatible with materials which react with water. Avoid contact with: Strong acids Strong bases Strong oxidizing agents Strong reducing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
C12-15 alcohol ethyoxylated	Not determined	Not determined	Not determined
Sodium dodecyl sulphate	Not determined	Not determined	Not determined
1,4-Dioxane (Impurity)	90 ppm STEL 135 mg/m³ STEL 25 ppm TWA 90 mg/m³ TWA	10ppmTWA 36mg/m³TWA	Skin designation Suspected Human Carcinogen 20 ppm TWA 72 mg/m³ TWA
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**

C12-15 alcohol ethyoxylated	Not determined	Not determined	Not determined
Sodium dodecyl sulphate	Not determined	Not determined	Not determined
1,4-Dioxane (Impurity)	Not determined	20 ppm TWA 90 mg/m³ TWA Skin notation	May cause substantial skin absorption 10 ppm ACL 1 ppm OEL 3.6 mg/m³ OEL
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
C12-15 alcohol ethyoxylated	Not determined	Not determined	Not determined
Sodium dodecyl sulphate	Not determined	Not determined	Not determined
1,4-Dioxane (Impurity)	10 mg/m³ MAC	90.0 mg/m³ TWA 25.0 ppm TWA Skin notation 3.6 mg/m³ STEL	25 ppm TWA 90 mg/m³ TWA Confirmed carcinogen Possibility of significant uptake through the skin
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
C12-15 alcohol ethyoxylated	Not determined	Not determined	Not determined
Sodium dodecyl sulphate	Not determined	Not determined	Not determined
1,4-Dioxane (Impurity)	20 ppm TWA 72.1 mg/m³ TWA Skin notation	skin - potential for cutaneous absorption 100 ppm TWA 360 mg/m³ TWA	Skin notation 10 mg/m³ MAC Skin
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
C12-15 alcohol ethyoxylated	Not determined	Not determined	Not determined
Sodium dodecyl sulphate	Not determined	Not determined	Not determined
1,4-Dioxane (Impurity)	100 ppm TWA	10 mg/m³ TWA	20 ppm TWA 73 mg/m³ TWA
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Neoprene Nitrile PVC
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Slight
Color	Milky white

Property	**Values**	**Remarks**
pH	6 - 8	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / > 212 °F	Closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	12.60 %(V)	
Lower explosion limit	2.60 %(V)	
Vapor pressure	< 23.5 mmgHg (31.33 hPa)	@ 25 °C
Relative Vapor Density	No information available	
Specific gravity	1.01 - 1.02	@ 20 °C
Bulk density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Do not freeze. Store away from heat and sources of ignition.

10.5 Incompatible materials

Incompatible with materials which react with water. Strong acids. Strong bases. Strong oxidizing agents. Strong reducing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
C12-15 alcohol ethyoxylated	2.500- 5.000 mg/kg	= 2500 mg/kg (Rabbit)	No data available
Sodium dodecyl sulphate	= 1288 mg/kg (Rat)	= 200 mg/kg (Rabbit)	> 3900 mg/m³ (Rat) 1 h
1,4-Dioxane (Impurity)	= 4200 mg/kg (Rat) = 5170 mg/kg (Rat)	= 7600 mg/kg (Rabbit)	= 46 mg/L (Rat) 2 h
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	= 53 mg/kg (Rat)	No data available	= 1.23 mg/L (Rat) 4 h = 0.11 mg/L (Rat) 4 h

Sensitization EUH208 - Contains (5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one). May produce an allergic reaction.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
C12-15 alcohol ethyoxylated	3.1 mg/L LC50 (Scophthalmus maximus) = 96 h	1 - 3.2 mg/L EC50 (Skeletonema costatum) = 72 h	0.88 mg/L LC50 (Acartia tonsa) = 48 h
Sodium dodecyl sulphate	= 1.31 mg/L LC50 Cyprinus carpio 96 h 10.8 - 16.6 mg/L LC50 Poecilia reticulata 96 h 13.5 - 18.3 mg/L LC50 Poecilia reticulata 96 h 6.2 - 9.6 mg/L LC50 Pimephales promelas 96 h 10.2 - 22.5 mg/L LC50 Pimephales promelas 96 h 5.8 - 7.5 mg/L LC50 Pimephales promelas 96 h = 4.5 mg/L LC50 Lepomis macrochirus 96 h 4.2 - 4.8 mg/L LC50 Lepomis macrochirus 96 h 4.06 - 5.75 mg/L LC50 Lepomis macrochirus 96 h 9.9 - 20.1 mg/L LC50 Brachydanio rerio 96 h = 7.97 mg/L LC50 Brachydanio rerio 96 h = 4.2 mg/L LC50 Oncorhynchus mykiss 96 h = 4.62 mg/L LC50 Oncorhynchus mykiss 96 h 4.3 - 8.5	= 42 mg/L EC50 Desmodesmus subspicatus 96 h = 117 mg/L EC50 Pseudokirchneriella subcapitata 96 h = 53 mg/L EC50 Desmodesmus subspicatus 72 h 30 - 100 mg/L EC50 Desmodesmus subspicatus 96 h 3.59 - 15.6 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 1.8 mg/L EC50 Daphnia magna 48 h = 21.2 mg/L EC50 Daphnia magna 24 h

	mg/L LC50 Oncorhynchus mykiss 96 h 22.1 - 22.8 mg/L LC50 Pimephales promelas 96 h 15 - 18.9 mg/L LC50 Pimephales promelas 96 h 8 - 12.5 mg/L LC50 Pimephales promelas 96 h = 4.1 mg/L LC50 Leuciscus idus 48 h		
1,4-Dioxane (Impurity)	= 9850 mg/L LC50 Pimephales promelas 96 h 10306 - 14742 mg/L LC50 Pimephales promelas 96 h > 10000 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 163 mg/L EC50 water flea 48 h
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	= 1.6 mg/L LC50 Oncorhynchus mykiss 96 h	0.11 - 0.16 mg/L EC50 Pseudokirchneriella subcapitata 72 h 0.03 - 0.13 mg/L EC50 Pseudokirchneriella subcapitata 96 h = 0.31 mg/L EC50 Anabaena flos-aquae 120 h	0.12 - 0.3 mg/L EC50 Daphnia magna 48 h 0.71 - 0.99 mg/L EC50 Daphnia magna 48 h = 4.71 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
C12-15 alcohol ethyoxylated	Readily degradable in marine screening test

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
C12-15 alcohol ethyoxylated	Not likely to bioaccumulate

12.4 Mobility

Mobility
Dispersible in water. See component information below.

Chemical Name	Mobility
C12-15 alcohol ethyoxylated	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
C12-15 alcohol ethyoxylated	No information available

12.5 Other adverse effects

None known. Check for additional information in sect. 7.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

1,4-Dioxane (Impurity)
Schedule 6
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one
Schedule 6

New Zealand Hazard Classification Not classified

HSNO approval no. Not required

Group number Not required

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	15-Jul-2016
Revision date	26-Apr-2021
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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SDS no. PID20095
Version 2
Revision date 07-Jul-2018
Supersedes Date: 25-Nov-2015

Safety Data Sheet
DEFOAM EXTREME*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DEFOAM EXTREME*
Product code PID20095

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Defoamer

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains , No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
May cause slight irritation

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Silicon oxide, Formaldehyde.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. If spilled, take caution, as material can cause surfaces to become very slippery. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid breathing vapors or mists. Avoid spills and splashing during use. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Keep at 2 - 26°C Protect from freezing Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	Contains no substances with occupational exposure limit values No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Break through time >480 minutes

	Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing and gloves Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Opaque
Odor	Mild
Color	Milky white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	> 100 °C / > 212 °F	estimated
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	< 20 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.01 g/cm³	@ 20°C.
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties No information available

Oxidizing properties	No information available

9.2 Other information

Pour point	-6.66°C / 20°F
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Not chemically reactive.

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Protect from freezing. Keep at 2 - 26°C.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation. May cause skin irritation and/or dermatitis. Repeated exposure may cause skin dryness or cracking.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

This product is expected to be readily biodegradable.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Dispersible in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code
Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	25-Nov-2015
Revision date	07-Jul-2018
Version	2
This SDS has been revised in the following section(s)	2, 7, 8, 15, 16 Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com

Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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Safety Data Sheet
DEFOAM PLUS* NS

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DEFOAM PLUS* NS
Product code PID18960

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Defoamer

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight
Color	Clear
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.95 - 0.97 kg/l	@ 20°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None

Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

LD50 Oral > 2000 mg/kg (rat) (based on components) (MIXTURE)

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae. (LC50 > 100 mg/l - aquatic species (MIXTURE)).

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

The product contains potentially bioaccumulating substances.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required

Group number Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	09-Oct-2015
Revision date	28-Jan-2019
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information

National occupational exposure limits

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SDS no. PID150
Version 8
Revision date 30-Jan-2020
Supersedes Date: 20-Apr-2016

Safety Data Sheet
DEFOAM*-A

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DEFOAM*-A
Product code PID150
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Defoamer

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2A
Reproductive toxicity	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation
H361 - Suspected of damaging fertility or the unborn child

Precautionary statements
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P337 + P313 - If eye irritation persists: Get medical advice/attention

Contains
2,2,4-trimethyl-1,3-pentanediol diisobutyrate

1,3-pentanediol, 2,2,4-trimethyl-

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	229-934-9	6846-50-0	10-30
1,3-pentanediol, 2,2,4-trimethyl-	205-619-1	144-19-4	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters

As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Not to be used by pregnant workers and workers who have recently given birth or who are breastfeeding.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	Not determined	Not determined	Not determined
1,3-pentanediol, 2,2,4-trimethyl-	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	Not determined	Not determined	Not determined
1,3-pentanediol, 2,2,4-trimethyl-	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	Not determined	Not determined	Not determined
1,3-pentanediol, 2,2,4-trimethyl-	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	Not determined	Not determined	Not determined
1,3-pentanediol, 2,2,4-trimethyl-	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	Not determined	Not determined	Not determined
1,3-pentanediol, 2,2,4-trimethyl-	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	-50 °C / -58 °F	
Boiling point/range	255 °C / 491 °F	
Flash point	110 °C / 230 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.95	@ 20°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	> 3200 mg/kg (Rat)	> 2000 mg/kg (rabbit) - Literature data	> 5.3 mg/L (Rat) 6 h
1,3-pentanediol, 2,2,4-trimethyl-	= 2 g/kg (Rat)	= 6300 µL/kg (Rabbit)	> 4.5 mg/L (Rat) 6 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Routes of Exposure Eye contact.

Routes of entry None known.

Specific target organ toxicity - Not classified

Single exposure
Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,2,4-trimethyl-1,3-pentanediol diisobutyrate	> 1.55 mg/L LC50 Pimephales promelas 96 h	> 7.49 mg/l EC50 - 72 h - Literature data	> 1.46 mg/L EC50 Daphnia magna 48 h
1,3-pentanediol, 2,2,4-trimethyl-	> 700 mg/L LC50 Lepomis macrochirus 96 h	> 100 mg/l EC50 - 72 h - Literature data	> 100 mg/l EC50 - 48 h - Literature data

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002503
Group number	6.4A, 6.8A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	20-Apr-2016
Revision date	30-Jan-2020
Version	8
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	1
Physical hazard	1
PPE	X

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SDS no. PID3378
Version 6
Revision date 03-Feb-2017
Supersedes Date: 26-Oct-2015

Safety Data Sheet
DI-BALANCE*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DI-BALANCE*
Product code PID3378

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
Magnesium oxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Magnesium oxide	215-171-9	1309-48-4	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water. Avoid generating or

breathing dust.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Interhalogens. Acids Water

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Magnesium oxide	10 mg/m³ TWA	10mg/m³TWAfume	10 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Magnesium oxide	Not determined	10 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Magnesium oxide	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Magnesium oxide	10 mg/m³ TWA	15 mg/m³ TWA	4 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Magnesium oxide	Not determined	5 mg/m³ TWA 10 mg/m³ STEL	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Nitrile Neoprene PVC Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	10.0 - 11.0	@ 10%
Melting / freezing point	2100 °C / 3800 °F	
Boiling point/range	No information available	
Flash point	n/a	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	30-40 lb/ft3	
Relative density	3.56 sg	@ 25°C.
Water solubility	Slightly soluble in water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

The product reacts with water and will generate heat.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Interhalogens. Acids. Water.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Magnesium oxide	= 3990 mg/kg (Rat) = 3870	No data available	No data available

	mg/kg (Rat)		

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Magnesium oxide	No information available	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Magnesium oxide	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Magnesium oxide	Product/Substance is inorganic

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Magnesium oxide	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Magnesium oxide	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated

IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	26-Oct-2015
Revision date	03-Feb-2017
Version	6
This SDS has been revised in the following section(s)	5, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

*A mark of M-I L.L.C., a Schlumberger Company

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Driscal® D Polymer

Version 1.14 Revision Date 2021-09-29

According to Regulation (EC) No. 1907/2006, Regulation (EC) No. 2015/830

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1

Product information

Product Name : Driscal® D Polymer
Material : 1112534, 1016818

EC-No.Registration number

Chemical name	CAS-No. EC-No. Index No.	Legal Entity Registration number
2-Acrylamido-2-Methylpropane Sulfonic Acid, Sodium Salt	5165-97-9 225-948-4	Chevron Phillips Chemicals International NV 01-2119495270-39-0016
2-Pyrrolidinone, 1-ethenyl-	88-12-0 201-800-4 613-168-00-0	Chevron Phillips Chemicals International NV 01-2119498301-39-XXXX

1.3

Details of the supplier of the safety data sheet

Company : Chevron Phillips Chemical Company LP
Drilling Specialties Company LLC
10001 Six Pines Drive
The Woodlands, TX 77380

Local : Chevron Phillips Chemicals International N.V.
Airport Plaza (Stockholm Building)
Leonardo Da Vincilaan 19
1831 Diegem
Belgium

SDS Requests: (800) 852-5530
Responsible Party: Product Safety Group
Email:sds@cpchem.com

1.4

Emergency telephone:

Health:

866.442.9628 (North America)
1.832.813.4984 (International)
Transport:
CHEMTREC 800.424.9300 or 703.527.3887(int'l)
Asia: CHEMWATCH (+612 9186 1132) China: 0532 8388 9090
EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)
Mexico CHEMTREC 01-800-681-9531 (24 hours)
South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600
Argentina: +(54)-1159839431

Responsible Department	:	Product Safety and Toxicology Group
E-mail address	:	SDS@CPChem.com
Website	:	www.CPChem.com

SECTION 2: Hazards identification

2.1

Classification of the substance or mixture
REGULATION (EC) No 1272/2008

Not a hazardous substance or mixture.

2.2

Labeling (REGULATION (EC) No 1272/2008)

Not a hazardous substance or mixture.

SECTION 3: Composition/information on ingredients

3.1 - 3.2
Substance or Mixture

Synonyms	:	High Temperature Polymer

Contains no hazardous ingredients according to GHS. :

Remarks	:	Contains no hazardous ingredients according to GHS.

SECTION 4: First aid measures

4.1

Description of first-aid measures

General advice	:	No hazards which require special first aid measures.
If inhaled	:	If unconscious, place in recovery position and seek medical advice. If symptoms persist, call a physician.
In case of eye contact	:	Remove contact lenses. Protect unharmed eye. If eye irritation persists, consult a specialist.
If swallowed	:	Keep respiratory tract clear. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious

person. If symptoms persist, call a physician.

SECTION 5: Firefighting measures

Flash point	:	Not applicable
Autoignition temperature	:	No data available

5.1 Extinguishing media

Unsuitable extinguishing media	:	High volume water jet.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting	:	Risks of ignition followed by flame propagation or secondary explosions can be caused by the accumulation of dust, e.g. on floors and ledges.

5.3 Advice for firefighters

Special protective equipment for fire-fighters	:	Wear self-contained breathing apparatus for firefighting if necessary.
Further information	:	Standard procedure for chemical fires. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Fire and explosion protection	:	Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Provide appropriate exhaust ventilation at places where dust is formed.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions	:	Avoid dust formation.

6.2 Environmental precautions

Environmental precautions	:	No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Methods for cleaning up	:	Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
Additional advice	:	Contaminated surfaces will be extremely slippery. Avoid spillage on floor as the product can become very slippery when wet. Sweep up to prevent slipping hazard. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air).

6.4

Reference to other sections

Reference to other sections	:	For personal protection see section 8. For disposal considerations see section 13.

SECTION 7: Handling and storage

7.1

Precautions for safe handling
Handling

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area.
Advice on protection against fire and explosion	:	Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Provide appropriate exhaust ventilation at places where dust is formed.

7.2

Conditions for safe storage, including any incompatibilities

Storage

Requirements for storage areas and containers	:	Electrical installations / working materials must comply with the technological safety standards.
Advice on common storage	:	No materials to be especially mentioned.

SECTION 8: Exposure controls/personal protection

8.2

Exposure controls
Engineering measures

Adequate ventilation to control airborned concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Personal protective equipment

Respiratory protection	:	Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as:. Air-Purifying Respirator for Dusts and Mists / P100. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, aerosolization, exposure

levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection	:	The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Eye protection	:	Eye wash bottle with pure water. Safety glasses.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. Wear as appropriate:. Protective suit. Safety shoes.
Hygiene measures	:	General industrial hygiene practice.

SECTION 9: Physical and chemical properties

9.1

Information on basic physical and chemical properties

Appearance

Form	:	Powder
Physical state	:	solid
Color	:	White
Odor	:	no odor
Odor Threshold	:	No data available

Safety data

Flash point	:	Not applicable
Lower explosion limit	:	No data available
Upper explosion limit	:	No data available
Oxidizing properties	:	No
Autoignition temperature	:	No data available
Thermal decomposition	:	No data available
Molecular weight	:	Not applicable
pH	:	Not applicable
Pour point	:	No data available
Boiling point/boiling range	:	No data available

Vapor pressure	:	No data available
Relative density	:	1,44
Density	:	No data available
Water solubility	:	soluble
Partition coefficient: n-octanol/water	:	Pow: < 3
Viscosity, kinematic	:	No data available
Relative vapor density	:	No data available
Evaporation rate	:	No data available

SECTION 10: Stability and reactivity

10.1

Reactivity : Stable at normal ambient temperature and pressure.

10.2

Chemical stability : This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

10.3

Possibility of hazardous reactions

Hazardous reactions : Further information: Stable under recommended storage conditions., No hazards to be specially mentioned.

10.4

Conditions to avoid : No data available.

10.5

Materials to avoid : No data available.

Thermal decomposition : No data available

10.6

Other data : No decomposition if stored and applied as directed.

SECTION 11: Toxicological information

11.1

Information on toxicological effects

Driscal® D Polymer

Further information : The product contains no substances classified as hazardous to health in concentrations which should be taken into account.

SECTION 12: Ecological information

12.1
Toxicity

Ecotoxicity effects

Toxicity to fish : LC50: > 1.800 mg/l
Exposure time: 96 h
Species: Scophthalmus maximus (Flatfish, Flounder)
static test Method: PARCOM Protocol Part B

Toxicity to daphnia and other aquatic invertebrates : LC50: 599 mg/l
Exposure time: 48 h
Species: Acartia tonsa (Marine Copepod)
static test Method: ISO TC147/SC5/WG2

Toxicity to algae : EC50: 2.693 mg/l
Exposure time: 72 h
Species: Skeletonema costatum (marine diatom)
static test Method: ISO 10253

12.2
Persistence and degradability

Biodegradability : This material is not expected to be readily biodegradable.

12.3
Bioaccumulative potential
Elimination information (persistence and degradability)

Bioaccumulation : Accumulation in aquatic organisms is unlikely.
The polymer is too large to be bioavailable.

12.4
Mobility in soil

Mobility : No data available

12.5
Results of PBT and vPvB assessment
Results of PBT assessment : This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6
Other adverse effects
Additional ecological information : This material is not expected to be harmful to aquatic organisms.

Ecotoxicology Assessment

Short-term (acute) aquatic hazard	:	This material is not expected to be harmful to aquatic organisms.
Long-term (chronic) aquatic hazard	:	This material is not expected to be harmful to aquatic organisms.

SECTION 13: Disposal considerations

13.1

Waste treatment methods

The information in this SDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

Contaminated packaging	:	Empty containers should be taken to an approved waste handling site for recycling or disposal.

SECTION 14: Transport information

14.1 - 14.7

Transport information

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY INLAND WATERWAYS)
NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

Maritime transport in bulk according to IMO instruments

SECTION 15: Regulatory information

15.1

Safety, health and environmental regulations/legislation specific for the substance or mixture
National legislation

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Water contaminating class (Germany) : nwg not water endangering

15.2

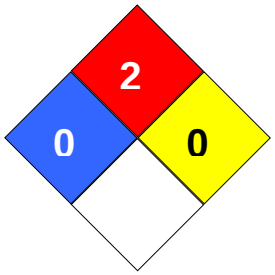
Major Accident Hazard Legislation : ZEU_SEVES3 Update:
Not applicable

Notification status

Europe REACH	:	On the inventory, or in compliance with the inventory
Switzerland CH INV	:	On the inventory, or in compliance with the inventory
United States of America (USA) TSCA	:	All substances listed as active on the TSCA inventory
Canada DSL	:	All components of this product are on the Canadian DSL
Other AIIC	:	On the inventory, or in compliance with the inventory
New Zealand NZIoC	:	On the inventory, or in compliance with the inventory
Japan ENCS	:	On the inventory, or in compliance with the inventory
Taiwan TCSI	:	Not in compliance with the inventory
Korea KECI	:	Not in compliance with the inventory
Philippines PICCS	:	Not in compliance with the inventory
China IECSC	:	This product contains one or more substances that have been notified under New Substances Notification laws. However, only CPChem and other independent notifiers are approved to be the importers of record.

SECTION 16: Other information

NFPA Classification : Health Hazard: 0
Fire Hazard: 2
Reactivity Hazard: 0



Further information

Legacy SDS Number : 244990

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this SDS pertains only to the product as shipped.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Key or legend to abbreviations and acronyms used in the safety data sheet			
ACGIH	American Conference of Government Industrial Hygienists	LD50	Lethal Dose 50%
AICS	Australia, Inventory of Chemical Substances	LOAEL	Lowest Observed Adverse Effect Level
DSL	Canada, Domestic Substances List	NFPA	National Fire Protection Agency
NDSL	Canada, Non-Domestic Substances List	NIOSH	National Institute for Occupational Safety & Health
CNS	Central Nervous System	NTP	National Toxicology Program
CAS	Chemical Abstract Service	NZIoC	New Zealand Inventory of Chemicals
EC50	Effective Concentration	NOAEL	No Observable Adverse Effect Level
EC50	Effective Concentration 50%	NOEC	No Observed Effect Concentration
EGEST	EOSCA Generic Exposure Scenario Tool	OSHA	Occupational Safety & Health Administration
EOSCA	European Oilfield Specialty Chemicals Association	PEL	Permissible Exposure Limit
EINECS	European Inventory of Existing Chemical Substances	PICCS	Philippines Inventory of Commercial Chemical Substances
MAK	Germany Maximum Concentration Values	PRNT	Presumed Not Toxic
GHS	Globally Harmonized System	RCRA	Resource Conservation Recovery Act
>=	Greater Than or Equal To	STEL	Short-term Exposure Limit
IC50	Inhibition Concentration 50%	SARA	Superfund Amendments and Reauthorization Act.
IARC	International Agency for Research on Cancer	TLV	Threshold Limit Value
IECSC	Inventory of Existing Chemical Substances in China	TWA	Time Weighted Average
ENCS	Japan, Inventory of Existing and	TSCA	Toxic Substance Control Act

	New Chemical Substances		
KECI	Korea, Existing Chemical Inventory	UVCB	Unknown or Variable Composition, Complex Reaction Products, and Biological Materials
<=	Less Than or Equal To	WHMIS	Workplace Hazardous Materials Information System
LC50	Lethal Concentration 50%		

SDS no. PID18257
Version 4
Revision date 16-Jun-2017
Supersedes Date: 23-Feb-2017

Safety Data Sheet
D-SOLVER 7*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D-SOLVER 7*
Product code PID18257
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Chelating agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H332 - Harmful if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	241-543-5	17572-97-3	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel

should) give oxygen. Obtain medical attention.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits

The product does not contain any hazardous materials with occupational exposure limits established.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown)

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight Ammoniacal
Color	Light yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	7.7 - 8.1	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	105 - 110 °C / 221 - 230 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.30 - 1.32	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	Not applicable

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Harmful by inhalation. May cause damage to organs through prolonged or repeated exposure.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Tripotassium hydrogen 2,2',2'',2'''-(ethane-1,2-diyldinitrilo)tetraacetate	No information available	No information available	No information available

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow
< 0

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	23-Feb-2017
Revision date	16-Jun-2017
Version	4
This SDS has been revised in the following section(s)	1, 14, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID18883
Version 4
Revision date 13-Mar-2019
Supersedes Date: 07-Jun-2017

Safety Data Sheet
D-SOLVER EXTRA*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D-SOLVER EXTRA*
Product code PID18883

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Chelating agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse

Contains
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid

Trisodium [{ 2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate

2,2'',2''-nitrilotriacetic acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	205-759-3	150-39-0	10-30
Trisodium [{ 2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate	205-381-9	139-89-9	10-30
2,2'',2''-nitrilotriacetic acid	205-355-7	139-13-9	<5

Comments
H318 do not apply. The overall product classification is H319 due to pH.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if irritation persists.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products

Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	Not determined	Not determined	Not determined
Trisodium [{2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate	Not determined	Not determined	Not determined
2,2",2"-nitrilotriacetic acid	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	Not determined	Not determined	Not determined
Trisodium [{2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate	Not determined	Not determined	Not determined
2,2",2"-nitrilotriacetic acid	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	Not determined	Not determined	Not determined
Trisodium [{2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate	Not determined	Not determined	Not determined
2,2",2"-nitrilotriacetic acid	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	Not determined	Not determined	Not determined
Trisodium [{2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate	Not determined	Not determined	Not determined
2,2",2"-nitrilotriacetic acid	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	Not determined	Not determined	Not determined
Trisodium [{2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate	Not determined	Not determined	Not determined
2,2",2"-nitrilotriacetic acid	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene PVC Break through time >480 minutes Glove thickness =>0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight Ammoniacal
Color	Clear - Dark
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	4.4 - 5.0	Conc.solution
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	105 - 110 °C / 221 - 230 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.15 - 1.25	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	

Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	<0

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

LD50 Oral > 2000 mg/kg Calculated (PRODUCT)

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	No data available	No data available	No data available
Trisodium [{ 2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate	= 10000 mg/kg (Rat)	No data available	No data available
2,2",2"-nitrilotriacetic acid	= 1100 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact. Skin contact.

Routes of entry None known.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	No information available	No information available	No information available
Trisodium [{	No information available	No information available	No information available

2-[bis(carboxylatomethyl)amino]ethyl} (2-hydroxyethyl)amino]acetate			
2,2'',2''-nitrilotriacetic acid	No information available	No information available	No information available

12.2 Persistence and degradability

Not readily biodegradable. See component information below.

Chemical Name	Persistence and degradability
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	Moderate biodegradation
2,2'',2''-nitrilotriacetic acid	Moderate biodegradation

12.3 Bioaccumulative potential

Bioaccumulation is unlikely. See component information below.

Chemical Name	Bioaccumulation
N-(2-Hydroxyethyl)ethylenediaminetriacetic acid	Does not bioaccumulate
2,2'',2''-nitrilotriacetic acid	Not likely to bioaccumulate

log Pow
<0

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	07-Jun-2017
Revision date	13-Mar-2019
Version	4
This SDS has been revised in the following section(s)	1, 2, 7, 8, 9, 12, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
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SDS no. PID17208
Version 4
Revision date 21-Jun-2017
Supersedes Date: 17-Aug-2016

Safety Data Sheet
D-SOLVER HD*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D-SOLVER HD*
Product code PID17208

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion fluid additive.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse

Contains
N,N-Bis(carboxymethyl)-L-glutamic acid

Nitrilotriacetic acid

Glycolic acid (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
N,N-Bis(carboxymethyl)-L-glutamic acid	261-530-8	58976-65-1	10-30
Glycolic acid (impurity)	201-180-5	79-14-1	<3
Nitrilotriacetic acid	205-355-7	139-13-9	<3

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits

Contains no substances with occupational exposure limit values
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
N,N-Bis(carboxymethyl)-L-glutamic acid	Not determined	Not determined	Not determined
Nitrilotriacetic acid	Not determined	Not determined	Not determined
Glycolic acid (impurity)	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
N,N-Bis(carboxymethyl)-L-glutamic acid	Not determined	Not determined	Not determined
Nitrilotriacetic acid	Not determined	Not determined	Not determined
Glycolic acid (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
N,N-Bis(carboxymethyl)-L-glutamic acid	Not determined	Not determined	Not determined
Nitrilotriacetic acid	Not determined	Not determined	Not determined
Glycolic acid (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
N,N-Bis(carboxymethyl)-L-glutamic acid	Not determined	Not determined	Not determined
Nitrilotriacetic acid	Not determined	Not determined	Not determined
Glycolic acid (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
N,N-Bis(carboxymethyl)-L-glutamic acid	Not determined	Not determined	Not determined
Nitrilotriacetic acid	Not determined	Not determined	Not determined
Glycolic acid (impurity)	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Viton Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight Ammoniacal
Color	Dark amber - Clear Yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	3.4 - 3.8	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Non-flammable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.3	20 °C
Bulk density	No information available	
Relative density	1150 - 1380 kg/m³	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Causes skin irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
N,N-Bis(carboxymethyl)-L-glutamic acid	No data available	No data available	No data available
Nitrilotriacetic acid	= 1100 mg/kg (Rat)	No data available	No data available
Glycolic acid (impurity)	= 1950 mg/kg (Rat)	No data available	= 3.6 mg/L (Rat) 4 h > 5.2 mg/L (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure	Skin contact. Eye contact.
Routes of entry	Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
N,N-Bis(carboxymethyl)-L-glutamic acid	No information available	No information available	No information available
Nitrilotriacetic acid	EC50: >100mg/l (24h, Daphnia magna)	No information available	No information available
Glycolic acid (impurity)	> 5000 mg/L LC50 Brachydanio rerio 96 h	No information available	No information available

12.2 Persistence and degradability

Readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow
<0

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Glycolic acid (impurity)
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	17-Aug-2016
Revision date	21-Jun-2017

Version	4
This SDS has been revised in the following section(s)	1, 2, 8, 14, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID17038
Version 5
Revision date 25-Feb-2021
Supersedes Date: 16-Jun-2017

Safety Data Sheet
D-SOLVER* D

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D-SOLVER* D
Product code PID17038

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Chelating agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Serious eye damage/eye irritation	Category 2
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation
H332 - Harmful if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P314 - Get medical advice/attention if you feel unwell
P337 + P313 - If eye irritation persists: Get medical advice/attention

Contains
Ethylenediaminetetraacetic acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Ethylenediaminetetraacetic acid	200-449-4	60-00-4	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Obtain medical attention.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters

As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Protect from moisture Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Ethylenediaminetetraacetic acid	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Ethylenediaminetetraacetic acid	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethylenediaminetetraacetic acid	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethylenediaminetetraacetic acid	Not determined	Not determined	2 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethylenediaminetetraacetic acid	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Use protective gloves made of: Neoprene Nitrile PVC Frequent change is advisable

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Solid
Appearance — Powder Dust

Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	2-3	Conc. solution
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	>= 40 g/m³	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.6 - 0.8	
Bulk density	~800 kg/m³	
Relative density	No information available	
Water solubility	slightly soluble	~0.2 (g/100g H2O@20°C)
Solubility in other solvents	No information available	
Autoignition temperature	> 200 °C / > 392 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	< 0	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Harmful by inhalation. May cause damage to organs through prolonged or repeated exposure.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylenediaminetetraacetic acid	4500 mg/kg (Rat) OECD 401 ECHA Data	No data available	> 1 - 5 mg/l 4h dust/mist OECD 412 Vendor Data

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylenediaminetetraacetic acid	> 100 mg/l 96h LC50 Lepomis macrochirus (Bluegill sunfish) Vendor data	> 300 mg/L 72h EC50 Pseudokirchneriella subcapitata (green algae) Vendor Data	140 mg/L 48h EC50 Daphnia magna Vendor Data

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow
< 0

12.4 Mobility

Mobility
Slightly soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylenediaminetetraacetic acid
Schedule 4

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	16-Jun-2017
Revision date	25-Feb-2021
Version	5
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID11926
Version 7
Revision date 16-Aug-2019
Supersedes Date: 22-Sep-2015

Safety Data Sheet
D-SOLVER*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D-SOLVER*
Product code PID11926
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Corrosion inhibitor Scale dissolver

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Dipotassium ethylenediaminetetraacetate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Dipotassium ethylenediaminetetraacetate	217-895-0	2001-94-7	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Excessive heat Strong oxidizing agents Bases Aluminum Nickel Copper Zinc

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Dipotassium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Dipotassium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Dipotassium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Dipotassium ethylenediaminetetraacetate	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Dipotassium ethylenediaminetetraacetate	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Butyl PVC Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight Ammoniacal
Color	Yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	4.5 - 5.0	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	105 - 110 °C / 221 - 230 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		

Upper flammability limit	Not applicable
Lower flammability limit	Not applicable
Vapor pressure	Similar to water
Vapor density	Similar to water.
Specific gravity	1.1 - 1.2
Bulk density	No information available
Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Stable under recommended storage conditions.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Excessive heat.

10.5 Incompatible materials

Strong oxidizing agents. Aluminum. Nickel. Copper. Zinc. Bases.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Dipotassium ethylenediaminetetraacetate	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Dipotassium ethylenediaminetetraacetate	No information available	No information available	No information available

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies

Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	22-Sep-2015
Revision date	16-Aug-2019
Version	7
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID14578
Version 4
Revision date 08-Jun-2019
Supersedes Date: 20-Dec-2018

Safety Data Sheet
D-STRUCTOR*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name D-STRUCTOR*
Product code PID14578
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Filter cake remover.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H318 - Causes serious eye damage

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P270 - Do not eat, drink or smoke when using this product
P330 - Rinse mouth

Contains
2-(formyloxy)ethyl formate

Ethylene Glycol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2-(formyloxy)ethyl formate	211-077-7	629-15-2	10-30
Ethylene Glycol	203-473-3	107-21-1	5-10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters

As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong oxidizing agents Strong acids Strong alkalies.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
2-(formyloxy)ethyl formate	Not determined	Not determined	Not determined
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	39.4 ppm Ceiling 100 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
2-(formyloxy)ethyl formate	Not determined	Not determined	Not determined
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2-(formyloxy)ethyl formate	Not determined	Not determined	Not determined
Ethylene Glycol	5 mg/m³ MAC	125 mg/m³ TWA 50.0 ppm TWA 100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2-(formyloxy)ethyl formate	Not determined	Not determined	Not determined
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2-(formyloxy)ethyl formate	Not determined	Not determined	Not determined
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness 0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection No personal respiratory protective equipment normally required When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with a vapor filter (EN 141) Type ABEKP At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing

before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Pungent
Color	Colorless - Pale yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	4.0 - 4.5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	100 °C / 212 °F	
Flash point	93 °C / 200 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.15	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong alkalies.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Harmful if swallowed.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-(formyloxy)ethyl formate	= 1510 mg/kg (Rat)	No data available	No data available
Ethylene Glycol	= 4700 mg/kg (Rat)	= 9530 µL/kg (Rabbit) = 10600 mg/kg (Rat)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Eye contact. Ingestion.
Routes of entry	Eye contact. Ingestion.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-(formyloxy)ethyl formate	No information available	No information available	No information available
Ethylene Glycol	= 16000 mg/L LC50 Poecilia reticulata 96 h 40000 - 60000 mg/L LC50 Pimephales promelas 96 h = 40761 mg/L LC50 Oncorhynchus mykiss 96 h = 27540 mg/L LC50 Lepomis macrochirus 96 h 14 - 18 mL/L LC50 Oncorhynchus mykiss 96 h = 41000 mg/L LC50 Oncorhynchus mykiss 96 h	6500 - 13000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 46300 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
2-(formyloxy)ethyl formate	Rapidly biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
2-(formyloxy)ethyl formate	Not likely to bioaccumulate log Kow <3

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated

IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Does not comply

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	20-Dec-2018
Revision date	08-Jun-2019
Version	4
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	1
Physical hazard	1
PPE	X

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SDS no. PID552
Version 8
Revision date 08-Mar-2019
Supersedes Date: 19-Feb-2018

Safety Data Sheet
DUAL-FLO* HT

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DUAL-FLO* HT
Product code PID552

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Filtration-control.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Starch

2.3 Other hazards

Suspended dust may present a dust explosion hazard
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Starch	232-679-6	9005-25-8	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Starch	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Starch	Not determined	10 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Starch	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Starch	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Starch	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical

hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. See section 7 for more information

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Mild
Color	White - Off-white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	5.0 - 8.0	@4%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	@ 20 °C
Bulk density	30 - 45 lb/ft³	
Relative density	No information available	

Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Starch	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Starch	No information available	No information available	No information available

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated

IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	19-Feb-2018
Revision date	08-Mar-2019
Version	8
This SDS has been revised in the following section(s)	1, 2, 15, No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID2035
Version 8
Revision date 08-Mar-2019
Supersedes Date: 14-Mar-2018

Safety Data Sheet
DUAL-FLO*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DUAL-FLO*
Product code PID2035

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Filtration-control.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components
2.3 Other hazards

Suspended dust may present a dust explosion hazard
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust

formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Protect from moisture Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient

	ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Slight
Color	Off-white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	9.0 - 10.5	@4%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	20 °C
Bulk density	30-40 lb/lb/ft³	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	14-Mar-2018
Revision date	08-Mar-2019
Version	8
This SDS has been revised in the	1, 2, 15, No changes with regard to classification have been made.

following section(s)

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood Follow general hygiene considerations recognized as common good workplace practices

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SDS no. PID2112
Version 4
Revision date 24-Jul-2018
Supersedes Date: 05-Jan-2016

Safety Data Sheet
DUO-TEC*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DUO-TEC*
Product code PID2112

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Glyoxal

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Combustible dust

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Glyoxal	203-474-9	107-22-2	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to

hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Suspended dust may present a dust explosion hazard. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Use non-sparking tools and equipment. Take precautionary measures against static discharges.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Persons susceptible to allergic reactions should not handle this product. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges. Use spark-proof tools and explosion-proof equipment.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Chemical Name	Arabic	Australia	Egypt
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Glyoxal	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Butyl Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Mild
Color	Cream - Tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	7	@ 1% sol.
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	

Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	20 °C
Bulk density	50 lb/ft³ (800 kg/m³)	
Relative density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	> 200 °C / > 392 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glyoxal	= 200 mg/kg (Rat)	= 12700 mg/kg (Rabbit)	= 2410 mg/m³, 3-4 hrs

Sensitization EUH208 - Contains (Glyoxal). May produce an allergic reaction.

Mutagenic effects Contains an known or suspected mutagen.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact.

Routes of entry Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Glyoxal	> 1000 mg/l LC50 Scophthalmus Maximus 96h SLB data	207 mg/l EC50 Skeletonema 72h SLB data	259 mg/L LC50 Acartia 48h SLB Data

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Glyoxal	Not biodegradable (<60% 28 days)

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Glyoxal	Does not bioaccumulate

12.4 Mobility

Mobility
Dispersible in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused Dispose of in accordance with local regulations.

products

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated
New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the

occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	05-Jan-2016
Revision date	24-Jul-2018
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID510
Version 12
Revision date 16-Nov-2018
Supersedes Date: 09-Jul-2018

Safety Data Sheet
DUO-VIS*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name DUO-VIS*
Product code PID510

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Glyoxal

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Product dust may be irritating to eyes, skin and respiratory system
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Glyoxal	203-474-9	107-22-2	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Glyoxal	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Butyl Neoprene Nitrile Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Mild
Color	Cream - Tan
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	7	@ 1% sol.
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	

Vapor density	No information available	
Specific gravity	1.5	20 °C
Bulk density	50 lb/ft³ (800 kg/m³)	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	> 200 °C / > 392 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid dust formation. Heat, flames and sparks. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glyoxal	= 200 mg/kg (Rat)	= 12700 mg/kg (Rabbit)	= 2410 mg/m³, 3-4 hrs

Sensitization EUH208 - Contains (Glyoxal). May produce an allergic reaction.

Mutagenic effects Contains an known or suspected mutagen.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Glyoxal	= 215 mg/L LC50 Pimephales	<= 348.59 mg/L EC50	= 404 mg/L EC50 Daphnia magna

	promelas 96 h 460 - 680 mg/L LC50 Leuciscus idus 96 h	Pseudokirchneriella subcapitata 96 h > 500 mg/L EC50 Desmodesmus subspicatus 96 h > 500 mg/L EC50 Desmodesmus subspicatus 72 h	48 h

12.2 Persistence and degradability

The product contains substances which are not expected to be biodegradable. See component information below.

Chemical Name	Persistence and degradability
Glyoxal	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Glyoxal	Not likely to bioaccumulate - Bioconcentration factor (BCF) 2.155

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
Glyoxal	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Glyoxal	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	09-Jul-2018
Revision date	16-Nov-2018
Version	12
This SDS has been revised in the following section(s)	2, 6, No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	0
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D247
Version 2
Revision date 02-Dec-2019
Supersedes Date: 17-Dec-2015

Safety Data Sheet
Dye D247

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Dye D247
Product code D247

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H373 - May cause damage to organs through prolonged or repeated exposure if swallowed

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Ethylene Glycol

Acetic acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Ethylene Glycol	203-473-3	107-21-1	10 < 25
Acetic acid	200-580-7	64-19-7	1 - 5

Comments
The product contains other ingredients which do not contribute to the overall classification.

Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating and toxic gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	39.4 ppm Ceiling 100 mg/m³ Ceiling
Acetic acid	15 ppm STEL 37 mg/m³ STEL	15ppmSTEL 37mg/m³STEL	15 ppm STEL 37 mg/m³ STEL

	10 ppm TWA 25 mg/m³ TWA	10ppmTWA 25mg/m³TWA	10 ppm TWA 25 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Acetic acid	15 ppm STEL 37 mg/m³ STEL 10 ppm TWA 25 mg/m³ TWA	10 ppm TWA 25 mg/m³ TWA 15 ppm STEL 37 mg/m³ STEL	10 ppm OEL 25 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethylene Glycol	5 mg/m³ MAC	125 mg/m³ TWA 50.0 ppm TWA 100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Acetic acid	5 mg/m³ MAC	25 mg/m³ TWA 10 ppm TWA 20 mg/m³ TWA 5 ppm TWA 37 mg/m³ STEL 15 ppm STEL 20 mg/m³ STEL 5 ppm STEL	15 ppm STEL 37 mg/m³ STEL 10 ppm TWA 25 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Acetic acid	10 ppm TWA 25 mg/m³ TWA	10 ppm TWA 25 mg/m³ TWA	Skin notation 5 mg/m³ MAC Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA
Acetic acid	10 ppm TWA	25 mg/m³ TWA 35 mg/m³ STEL	10 ppm TWA 25 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Rubber Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No protective equipment is needed under normal use conditions In case of mist, spray or aerosol exposure wear suitable personal respiratory protection and protective suit Respirator with a vapor filter (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Pungent
Color	Dark Purple
Odor threshold	No information available

Property	Values	Remarks
pH	3 - 4	
pH @ dilution	No information available	
Melting / freezing point	-17 °C / 1.4 °F	
Boiling point/range	103 °C / 217.4 °F	
Flash point	> 93 °C / 199.4 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.02 - 1.06	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation. Components of the product may be absorbed into the body through the skin.

Ingestion May cause damage to organs through prolonged or repeated exposure.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene Glycol	= 4700 mg/kg (Rat)	= 9530 µL/kg (Rabbit) = 10600 mg/kg (Rat)	No data available
Acetic acid	= 3310 mg/kg (Rat)	= 1060 mg/kg (Rabbit)	= 11.4 mg/L (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Inhalation. Ingestion. Eye contact.
Routes of entry	Ingestion. Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Category 2.
Target organ effects	Kidney.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene Glycol	= 16000 mg/L LC50 Poecilia reticulata 96 h 40000 - 60000 mg/L LC50 Pimephales promelas 96 h = 40761 mg/L LC50 Oncorhynchus mykiss 96 h = 27540 mg/L LC50 Lepomis macrochirus 96 h 14 - 18 mL/L LC50 Oncorhynchus mykiss 96 h = 41000 mg/L LC50 Oncorhynchus mykiss 96 h	6500 - 13000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 46300 mg/L EC50 Daphnia magna 48 h
Acetic acid	= 75 mg/L LC50 Lepomis macrochirus 96 h = 79 mg/L LC50 Pimephales promelas 96 h	300.82 mg/l EC50 (Algae) = 72h 73,400 µg/l EC50 (Algae - Navicula seminulum) = 96h	= 47 mg/L EC50 Daphnia magna 24 h = 65 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Biodegradable.

Chemical Name	Persistence and degradability
Acetic acid	Readily biodegradable

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

Chemical Name	Bioaccumulation
Acetic acid	Bioconcentration factor (BCF) : 3.16 Does not bioaccumulate

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
Acetic acid	Soluble in water

Mobility in soil
No product level data available. See component information below.

Chemical Name	Mobility in soil
Acetic acid	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated

ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol
Schedule 6
Schedule 5
Acetic acid
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies

Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	17-Dec-2015
Revision date	02-Dec-2019
Version	2
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. 141633
Version 5
Revision date 25-Apr-2019
Supersedes Date: 15-Dec-2017

Safety Data Sheet
ECF-1868

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name ECF-1868
Product code 141633

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
May form combustible dust concentrations in air

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2-methylpropan-2-ol (impurity)	200-889-7	75-65-0	5-<10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically. Keep victim under observation.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Sulphur oxides, Ammonia, Hydrogen cyanide (hydrocyanic acid).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Strong oxidizing agents Strong acids
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene PVC Frequent change is advisable
Respiratory protection	No protective equipment is needed under normal use conditions In case of insufficient

	ventilation, wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Remove and wash contaminated clothing before re-use
Hygiene Measures	Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	2 - 5	@ 5 g/l
Melting / freezing point	> 150 °C / > 302 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.265	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150 °C / > 302 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	~ 0	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available

VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
Oxidizing agents may cause exothermic reactions.

10.4 Conditions to avoid

Take precautionary measures against static charges. Protect from moisture. Avoid dust formation. Avoid contact with heat, sparks, open flame, and static discharge.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Sensitization	This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow
~ 0

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	15-Dec-2017
Revision date	25-Apr-2019
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID18940
Version 2
Revision date 16-Mar-2017
Supersedes Date: 12-Feb-2014

Safety Data Sheet
ECF-2928

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name ECF-2928
Product code PID18940

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Cleaning compound

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Aspiration toxicity	Category 1
Acute toxicity - Dermal	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H304 - May be fatal if swallowed and enters airways
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P331 - Do NOT induce vomiting
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P309 + P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician
P330 - Rinse mouth
P362 - Take off contaminated clothing and wash before reuse

Contains
2-butoxyethanol

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*

D-Glucopyranose, oligomeric, C8-10 glycosides

1-Butoxypropan-2-ol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2-butoxyethanol	203-905-0	111-76-2	10-<30
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	926-141-6	RM1004246	10-30
D-Glucopyranose, oligomeric, C8-10 glycosides	500-220-1	68515-73-1	10-30
1-Butoxypropan-2-ol	225-878-4	5131-66-8	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.
*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Risk of product entering the lungs on vomiting after ingestion. If vomiting occurs spontaneously, minimize the risk of aspiration by properly positioning the affected person. Never give anything by mouth to an unconscious person. Immediate medical attention is required.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get immediate medical attention.

Eye Contact — Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Prevent the formation of vapors, mists and aerosols. Do not breathe vapors or spray mist.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m³ and ST. EXP = 10mg/m³.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
2-butoxyethanol	25 ppm TWA 121 mg/m³ TWA	50ppmSTEL 242mg/m³STEL 20ppmTWA 96.9mg/m³TWA	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
1-Butoxypropan-2-ol	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
2-butoxyethanol	Not determined	25 ppm TWA 121 mg/m³ TWA Skin notation	25 ppm ACL
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
1-Butoxypropan-2-ol	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2-butoxyethanol	5 mg/m³ MAC	Not determined	25 ppm TWA 121 mg/m³ TWA Possibility of significant uptake through the skin*1)
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
1-Butoxypropan-2-ol	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**

2-butoxyethanol	20 ppm TWA 96.7 mg/m³ TWA Skin notation*3)	skin - potential for cutaneous absorption 50 ppm TWA 240 mg/m³ TWA	5 mg/m³ MAC
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
1-Butoxypropan-2-ol	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2-butoxyethanol	50 ppm TWA	Not determined	50 ppm STEL 246 mg/m³ STEL Skin*2) 20 ppm TWA 98 mg/m³ TWA
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
1-Butoxypropan-2-ol	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Nitrile Rubber
Break through time >60 minutes
Glove thickness 0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with combination filter for vapour/particulate (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more

information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Characteristic
Color	Clear - Yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	68 °C / 154 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Emulsifies	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	0.910 g/cm3 @ 20°C

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation — Inhalation of vapors in high concentration may cause irritation of respiratory system. May cause additional affects as listed under "Ingestion".

Eye contact — Causes serious eye damage.

Skin contact — Harmful in contact with skin. Causes skin irritation. Components of the product may be absorbed into the body through the skin. Repeated exposure may cause skin dryness or cracking.

Ingestion — May be fatal if swallowed and enters airways. Potential for aspiration if swallowed. Aspiration may cause pulmonary edema and pneumonitis.

Unknown acute toxicity — Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-butoxyethanol	1200 mg/kg (Guinea pigs)	> 2000 mg/kg (Rat)	400 ppm (Rabbit)
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
D-Glucopyranose, oligomeric, C8-10 glycosides	> 2000 mg/kg bw (Rat) ECHA Data	> 2000 mg/kg (Rabbit) ECHA Data	No data available
1-Butoxypropan-2-ol	= 1900 mg/kg (Rat) = 5660 µL/kg (Rat)	= 3100 mg/kg (Rabbit)	No data available

Sensitization — This product does not contain any components suspected to be sensitizing.

Mutagenic effects — This product does not contain any known or suspected mutagens.

Carcinogenicity — This product does not contain any known or suspected carcinogens.

Reproductive toxicity — This product does not contain any known or suspected reproductive hazards.

Routes of exposure — Ingestion. Eye contact. Skin contact.

Routes of entry	Ingestion. Eye contact. Skin contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	May be fatal if swallowed and enters airways.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-butoxyethanol	= 2950 mg/L LC50 Lepomis macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 1698 - 1940 mg/L (LC50; Daphnia magna) = 1720 mg/L (EC50; water flea)
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	LC50 (Oncorhynchus mykiss (rainbow trout)): 2 - 5 mg/l Exposure time: 96 h Test Type: semi-static test Test substance: WAF Method: OECD Test Guideline 203 Remarks: Information given is based on data obtained from similar substances.	EL50 (Pseudokirchneriella subcapitata (green algae)): > 1 - 3 mg/l Exposure time: 72 h Test Type: static test Test substance: WAF Method: OECD Test Guideline 201 Remarks: Information given is based on data obtained from similar substances.	EL50 (Water flea (Daphnia magna)): 1,4 mg/l Exposure time: 48 h Test Type: static test Test substance: WAF Method: OECD Test Guideline 202 Remarks: Information given is based on data obtained from similar substances.
D-Glucopyranose, oligomeric, C8-10 glycosides	170 mg/l LC50 Zebra fish	37 mg/L (= 21 mg a.i./L) EC50 to the freshwater algae Scenedesmus subspicatus 72h	> 100 mg/l EC50 Daphnia magna 48h
1-Butoxypropan-2-ol	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available. See component information below.

Chemical Name	Persistence and degradability
2-butoxyethanol	Readily biodegradable
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Inherently biodegradable OECD 301F : 58.6% Duration 28 days
D-Glucopyranose, oligomeric, C8-10 glycosides	OECD 301 Readily biodegradable

1-Butoxypropan-2-ol	Readily biodegradable

12.3 Bioaccumulative potential

No product level data available. See component information below.

Chemical Name	Bioaccumulation
2-butoxyethanol	Not likely to bioaccumulate
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Does not bioaccumulate
D-Glucopyranose, oligomeric, C8-10 glycosides	Not likely to bioaccumulate
1-Butoxypropan-2-ol	Not likely to bioaccumulate log Kow =1.15

12.4 Mobility

Mobility
emulsifiable. See component information below.

Chemical Name	Mobility
2-butoxyethanol	Soluble in water
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Insoluble in water
D-Glucopyranose, oligomeric, C8-10 glycosides	Partially soluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
2-butoxyethanol	No information available
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
D-Glucopyranose, oligomeric, C8-10 glycosides	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused Dispose of in accordance with local regulations.

products

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-butoxyethanol
Schedule 6

New Zealand Hazard Classification Classified

HSNO approval no. HSR002525

Group number 6.1E, 6.1D, 6.3A, 8.3A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

CAS Number 64742-47-8 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	12-Feb-2014
Revision date	16-Mar-2017
Version	2
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
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SDS no. 142822
Version 1
Revision date 06-Jul-2018
Supersedes Date: None

Safety Data Sheet
ECF-3998

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name ECF-3998
Product code 142822
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Filtrate reducer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Combustible dust

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Do not breathe dust. Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Provide appropriate exhaust ventilation at places where dust is formed. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee

	training Repeated or prolonged contact Use protective gloves made of: Neoprene Nitrile PVC Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	No information available
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	6 - 8	@ 25% aqueous solution
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	0.35 - 0.65 g/cc	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Suspended dust may present a dust explosion hazard

Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

Avoid dust formation. Suspended dust may present a dust explosion hazard. Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Ingestion.
Routes of entry	Inhalation. Ingestion.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Revision date	06-Jul-2018
Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories

National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood Follow general hygiene considerations recognized as common good workplace practices

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. 142523
Version 1
Revision date 15-Feb-2018
Supersedes Date: None

Safety Data Sheet
EMI-1950

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name EMI-1950
Product code 142523
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

Glyoxal

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Contact with eyes may cause irritation

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	<5
Glyoxal	203-474-9	107-22-2	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.
This product contains a small quantity of quartz, crystalline silica. Repeated or prolonged inhalation of crystalline silica dust, exceeding the occupational exposure limits, can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL

			1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined
Glyoxal	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits See section 7 for more information

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

Respiratory protection No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Solid
Appearance Powder Dust
Odor Odorless
Color Light tan - Gray Green
Odor threshold Not applicable

Property	Values	Remarks
pH	9-10	
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.3 - 2.6	20 °C
Bulk density	48-52 lb/ft³ / 769-833 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available
Glyoxal	= 200 mg/kg (Rat)	= 12700 mg/kg (Rabbit)	= 2410 mg/m³, 3-4 hrs

Sensitization Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Mutagenic effects This product contains one or more substances which are classified in the EU as carcinogenic, mutagenic and/or reprotoxic.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	No information available	No information available	No information available
Glyoxal	= 215 mg/L LC50 Pimephales promelas 96 h 460 - 680 mg/L LC50 Leuciscus idus 96 h	<= 348.59 mg/L EC50 Pseudokirchneriella subcapitata 96 h > 500 mg/L EC50 Desmodesmus subspicatus 96 h > 500 mg/L EC50 Desmodesmus subspicatus 72 h	= 404 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Revision date	15-Feb-2018
Version	1
This SDS has been revised in the following section(s)	New

Classification procedure:
Classification is based on mixture calculation methods based on component data

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training advice:
It is a good industrial hygiene practice to minimize skin contact

*A mark of M-I L.L.C., a Schlumberger Company

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID18233
Version 3
Revision date 17-Apr-2019
Supersedes Date: 02-Oct-2018

Safety Data Sheet
EMI-2755

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name EMI-2755
Product code PID18233
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Hydrocarbon.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away

traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Protect from freezing Avoid extreme temperatures Keep away from direct sunlight.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Use protective gloves made of: Nitrile Neoprene Break through time >480 minutes

	Glove thickness 0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Milky
Odor	Mild
Color	White
Odor threshold	No information available

Property	**Values**	**Remarks**
pH	5 - 8	
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 93 °C / 200 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	17.5 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.03	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from freezing. Avoid extreme temperatures. Keep away from direct sunlight.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-Oct-2018
Revision date	17-Apr-2019
Version	3
This SDS has been revised in the following section(s)	2, 8, 15, No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier

National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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SDS no. D239
Version 2
Revision date 06-Jun-2018
Supersedes Date: 07-Aug-2014

Safety Data Sheet
Environmentally Friendly EXTENDER Express D239

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Environmentally Friendly EXTENDER Express D239
Product code D239

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
Eye Contact	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Dry chemical, CO_2, water spray or regular foam.

Extinguishing media which must not be used for safety reasons
Do not use halon type extinguisher.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Oxides of phosphorus, Carbon oxides (COx), Potassium oxide.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing When using do not eat, drink, smoke, sniff

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Protect from freezing Protect from moisture Keep away from direct sunlight. Incompatible with strong acids and bases Oxidizing agents Heavy metals
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes It is good practice to wear goggles when handling any chemical Tightly fitting safety goggles
Hand protection	Use protective gloves made of: polyvinyl alcohol or nitrile-butyl rubber gloves Break through time >480 minutes Glove thickness 0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Mild
Color	Off-white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	9	
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.25 - 1.35	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	1000 mPa.s	@ 25 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from freezing. Protect from moisture. Keep away from direct sunlight.

10.5 Incompatible materials

Incompatible with strong acids and bases. Oxidizing agents. Heavy metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified

Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	No hazard from product as supplied.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by

Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	07-Aug-2014
Revision date	06-Jun-2018
Version	2
This SDS has been revised in the following section(s)	2, 5, 7, 8, 9, 14, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	B

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SDS no. D174
Version 7
Revision date 28-Mar-2018
Supersedes Date: 19-Jan-2016

Safety Data Sheet
Expanding Cement Additive D174

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Expanding Cement Additive D174
Product code D174

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P362 - Take off contaminated clothing and wash before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Calcium magnesium oxide	253-425-0	37247-91-9	90-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Material becomes slippery when wet. Use caution if wet. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture Reacts violently with water Avoid contact with: Strong oxidizing agents Strong acids. Strong bases
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

Component Information

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	12.4	1385.2 mg/l @ 20°C
Melting / freezing point	> 450 °C / 842 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	

Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	3.41	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	Not applicable

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Exothermic reaction with:. Acids. Water.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong bases. Water.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	May cause irritation of respiratory tract.
Eye contact	Causes serious eye damage.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Unknown acute toxicity	Not applicable.
Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Skin contact. Eye contact. Inhalation.
Routes of entry	Skin contact. Eye contact. Inhalation.
Specific target organ toxicity - Single exposure	Category 3
Specific target organ toxicity - Repeated exposure	Not classified.
Target organ effects	Respiratory system.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

UN No. (ICAO/ANAC) UN1910

14.2. UN proper shipping name
Calcium Oxide (regulated only if transported by aircraft)

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division 8

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group III

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No Poison Schedule number allocated
New Zealand hazard classification Classified

HSNO approval no. HSR002544

Group number 6.3A, 8.3A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	19-Jan-2016
Revision date	28-Mar-2018
Version	7
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate

agreement between the parties.

SDS no. PID11950
Version 5
Revision date 31-May-2019
Supersedes Date: 02-Aug-2015

Safety Data Sheet
FILTER FLOC*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FILTER FLOC*
Product code PID11950
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Flocculating agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Ammonia, Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Chemical respirator with ammonia and amines cartridge (K/P2, green filter). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	7.4	Conc.solution
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	> 93 °C / > 200 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.011	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	43 - 53 cP	@ 48.8 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.
LD50 Oral	> 2000 mg/kg (rat) (MIXTURE)
Sensitization	This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae. IC 50, 72 Hrs, mg/l: >100.

Toxicity to fish
This product is not considered toxic to fish. LC 50, 96 Hrs, mg/l >100.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates. EC 50, 48 Hrs, mg/l: >100.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-Aug-2015
Revision date	31-May-2019
Version	5
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data

www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D189A
Version 4
Revision date 28-Apr-2021
Supersedes Date: 31-Jul-2019

Safety Data Sheet
Fine Cement D189A

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Fine Cement D189A
Product code D189A

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Sub-Category 1B
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary statements
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P272 - Contaminated work clothing should not be allowed out of the workplace
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Portland Cement Clinker

Blast furnace slag

Flue dust from production of clinker

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Portland Cement Clinker	266-043-4	65997-15-1	60-100

Blast furnace slag	266-002-0	65996-69-2	60-100
Flue dust from production of clinker	270-659-9	68475-76-3	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors React with hydrofluoric acid (HF) forming toxic gas (SiF4).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid contact with the skin and the eyes. Avoid dust formation. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Pick up and transfer to properly labeled containers. Keep in suitable, closed containers for disposal. Clean contaminated surface thoroughly. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Provide appropriate exhaust ventilation at places where dust is formed.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Oxidizing agents Strong acids Aluminum Hydrofluoric acid (HF)

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.
No biological limit allocated

Component Information

Chemical Name	**Arabic**	**Australia**	**Egypt**
Portland Cement Clinker	10 mg/m³ TWA	10 mg/m³ TWA	Not determined
Blast furnace slag	Not determined	Not determined	Not determined
Flue dust from production of clinker	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Portland Cement Clinker	10 mg/m³ TWA	10 mg/m³ TWA	4 mg/m³ OEL 1 mg/m³ OEL
Blast furnace slag	Not determined	Not determined	Not determined
Flue dust from production of clinker	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Portland Cement Clinker	Not determined	10.0 mg/m³ TWA 5.0 mg/m³ TWA	10 mg/m³ TWA
Blast furnace slag	Not determined	Not determined	Not determined
Flue dust from production of clinker	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Portland Cement Clinker	10 mg/m³ TWA	Not determined	Not determined
Blast furnace slag	Not determined	Not determined	Not determined
Flue dust from production of clinker	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Portland Cement Clinker	Not determined	Not determined	Not determined
Blast furnace slag	Not determined	Not determined	Not determined
Flue dust from production of clinker	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment
Eye protection Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious

	gloves made of: PVC disposable gloves Nitrile Neoprene Rubber gloves Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Dark gray

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	11.0 - 13.5	
Melting / freezing point	> 1250 °C / 2282 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	No information available	
Relative Vapor Density	No information available	
Specific gravity	2.75 - 3.20 g/cm³	
Bulk density	0.9 - 1.5 g/cm³	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	
Explosive properties	Not applicable	
Oxidizing properties	Not applicable	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid dust formation. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Oxidizing agents. Hydrofluoric acid (HF). Strong acids. Aluminum.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Contact with moist mucous membranes of the respiratory system can cause caustic condition resulting in burns.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation. May cause an allergic skin reaction.

Ingestion Ingestion may cause irritation to mucous membranes.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Portland Cement Clinker	No data available	No data available	No data available
Blast furnace slag	No data available	No data available	No data available

Flue dust from production of clinker	No data available	No data available	No data available

Sensitization May cause allergic skin reaction.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled. Risk of cancer depends on duration and level of exposure.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Inhalation. Eye contact.

Routes of entry Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Portland Cement Clinker	No information available	No information available	No information available
Blast furnace slag	No information available	No information available	No information available
Flue dust from production of clinker	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Persistence and degradability
Portland Cement Clinker	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Bioaccumulation
Portland Cement Clinker	Product/Substance is inorganic

12.4 Mobility

Mobility
Slightly soluble in water.

Mobility in soil
No information available.

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Portland Cement Clinker
Schedule 4
Schedule 6
Schedule 5
Blast furnace slag
Schedule 4
Schedule 6
Schedule 5
Flue dust from production of clinker
Schedule 4
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	31-Jul-2019
Revision date	28-Apr-2021

Version	4
This SDS has been revised in the following section(s)	3, 9, 15, No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3 *
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D059
Version 2
Revision date 15-Mar-2016
Supersedes date 05-May-2011

Safety Data Sheet
FLAC* D59 FLUID-LOSS ADDITIVE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FLAC* D59 FLUID-LOSS ADDITIVE
Product code D059

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material, Water spray mist or foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Wear suitable protective equipment. See also section 8. Use personal protective equipment.

Material can create slippery conditions.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Clean up promptly by sweeping or vacuum. Keep in suitable, closed containers for disposal. After cleaning, flush away traces with water. Material becomes slippery when wet. Use caution if wet.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Ensure all equipment is electrically grounded before beginning transfer operations.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded Avoid heat, flames and other sources of ignition. Keep away from direct sunlight. Avoid handling causing generation of dust. Store away from incompatibles, Acids Bases Strong oxidizing agents Hydrofluoric acid (HF)
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Control the source

Personal protective equipment

Eye protection	Use tight-fitting safety goggles, if not available use safety glasses with side-shields
Hand protection	Repeated or prolonged contact Use protective gloves made of: Neoprene gloves PVC disposable gloves Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181)
Skin and body protection	Clean, body-covering clothing Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules Powder
Odor	No information available
Color	Off-white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	6 - 8.5	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	30 g/m^3	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	460 °C / 860 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	1.38 g/cm3

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Heat, flames and sparks. Avoid handling causing generation of dust. Keep away from direct sunlight. Take precautionary measures against static charges.

10.5 Incompatible materials

Acids. Bases. Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Target organ effects	No information available.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

The product is expected to be slowly biodegradable.

12.3 Bioaccumulative potential

No data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes date	05-May-2011
Revision date	15-Mar-2016
Version	2
This SDS has been revised in the following section(s)	Updated according to GHS/CLP. This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

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SDS no. SYS00014
Version 2
Revision date 21-Jun-2017
Supersedes Date: 04-Aug-2016

Safety Data Sheet
FLOPRO NT* PREMIX

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FLOPRO NT* PREMIX
Product code SYS00014
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Pre-mix for Drilling Fluid.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

_

Contains
Calcium carbonate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium carbonate	207-439-9	471-34-1	10-30

Comments
Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium carbonate	Not determined	10mg/m³TWAinhalable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium carbonate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium carbonate	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene Break through time >480 minutes Glove thickness >=0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	No information available
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	9.5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	

Vapor density	No information available
Specific gravity	No information available
Bulk density	No information available
Relative density	1.24 sg
Water solubility	Miscible with water.
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available. See component information below.

Chemical Name	Persistence and degradability
Calcium carbonate	Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

No product level data available. See component information below.

Chemical Name	Bioaccumulation
Calcium carbonate	Product/Substance is inorganic

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Calcium carbonate	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium carbonate	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies

Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	04-Aug-2016
Revision date	21-Jun-2017
Version	2
This SDS has been revised in the following section(s)	1, 8, 9, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID3327
Version 3
Revision date 21-Jun-2017
Supersedes Date: 31-Aug-2016

Safety Data Sheet
FLOPRO NT*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FLOPRO NT*
Product code PID3327

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 67 009 214 162
Level 5
10 Telethon Avenue
Perth
WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

–

Contains
Sodium chloride

Potassium chloride

Calcium carbonate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium chloride	231-598-3	7647-14-5	0-30
Potassium chloride	231-211-8	7447-40-7	0-10
Calcium carbonate	207-439-9	471-34-1	5-60

Comments
Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium chloride	Not determined	Not determined	Not determined
Potassium chloride	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	10mg/m³TWAinhalable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium chloride	Not determined	Not determined	Not determined
Potassium chloride	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium chloride	5 mg/m³ MAC	Not determined	Not determined
Potassium chloride	5 mg/m³ MAC	Not determined	Not determined

Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium chloride	Not determined	Not determined	5 mg/m³ MAC
Potassium chloride	Not determined	Not determined	5 mg/m³ MAC
Calcium carbonate	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium chloride	Not determined	Not determined	Not determined
Potassium chloride	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Mild
Color	Off-white
Odor threshold	Not applicable

Property	Values	Remarks
pH	5.0 - 9.5	Cons. solution
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.0 - 2.2 sg	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h
Potassium chloride	= 2600 mg/kg (Rat)	No data available	No data available
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that

large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium chloride	4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h
Potassium chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h
Calcium carbonate	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available. See component information below.

Chemical Name	Persistence and degradability
Calcium carbonate	Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

No product level data available. See component information below.

Chemical Name	Bioaccumulation
Calcium carbonate	Product/Substance is inorganic

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Calcium carbonate	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium carbonate	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Potassium chloride
Schedule 4

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	31-Aug-2016
Revision date	21-Jun-2017
Version	3
This SDS has been revised in the following section(s)	1, 8, 9, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID620
Version 6
Revision date 28-Apr-2017
Supersedes Date: 24-Sep-2014

Safety Data Sheet
FLO-TROL*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FLO-TROL*
Product code PID620

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Filtration-control.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away

traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Protect from moisture Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces,

respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	7.0 - 8.0	@1%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	
Bulk density	30-37 lb/ft3	
Relative density	No information available	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	380 °C / 716 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available

VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	24-Sep-2014
Revision date	28-Apr-2017
Version	6

This SDS has been revised in the following section(s) All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID625
Version 4
Revision date 03-Jun-2019
Supersedes Date: 31-Mar-2015

Safety Data Sheet
FLO-VIS* L

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FLO-VIS* L
Product code PID625
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
(2-methoxymethylethoxy)propanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
(2-methoxymethylethoxy)propanol	252-104-2	34590-94-8	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Material becomes extremely slippery when wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
(2-methoxymethylethoxy)propanol	150 ppm STEL 909 mg/m³ STEL 100 ppm TWA 606 mg/m³ TWA	50ppmTWA 308mg/m³TWA	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
(2-methoxymethylethoxy)propanol	Not determined	100 ppm TWA 606 mg/m³ TWA Skin notation 150 ppm STEL 909 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
(2-methoxymethylethoxy)propanol	Not determined	Not determined	150 ppm STEL 909 mg/m³ STEL 100 ppm TWA 606 mg/m³ TWA Possibility of significant uptake through the skin
Chemical Name	**Malaysia**	**Philippines**	**Russia**

(2-methoxymethylethoxy)propanol	100 ppm TWA 606 mg/m³ TWA Skin notation	skin - potential for cutaneous absorption 100 ppm TWA 600 mg/m³ TWA	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
(2-methoxymethylethoxy)propanol	Not determined	Not determined	Skin 50 ppm TWA 308 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Transparent
Odor	Slight Ether
Color	Tan - Cream
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 149 °C / > 300 °F	
Flash point	99 °C / 211 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	0.4	@ 25 °C
Vapor density	No information available	
Specific gravity	1.1	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation. May be absorbed through the skin in harmful amounts.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
(2-methoxymethylethoxy)propanol	= 5.35 g/kg (Rat)	= 9500 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact.

Routes of entry Inhalation. Skin absorption.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
(2-methoxymethylethoxy)propanol	> 10000 mg/L LC50 Pimephales promelas 96 h	No information available	= 1919 mg/L LC50 Daphnia magna 48 h

12.2 Persistence and degradability

Product is biodegradable. See component information below.

Chemical Name	Persistence and degradability
(2-methoxymethylethoxy)propanol	Inherently biodegradable

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	31-Mar-2015
Revision date	03-Jun-2019
Version	4
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID627
Version 7
Revision date 12-Mar-2021
Supersedes Date: 02-May-2017

Safety Data Sheet
FLO-VIS* PLUS

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FLO-VIS* PLUS
Product code PID627

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Overseas Limited
Sonils Base Luanda Port
6460, Luanda Angola

+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
Glyoxal

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Glyoxal	203-474-9	107-22-2	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Protect from moisture Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Glyoxal	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Glyoxal	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Butyl Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	White - Tan
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	7	@ 1% sol.
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	

Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Protect from moisture. Take precautionary measures against static charges.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glyoxal	= 200 mg/kg (Rat)	= 12700 mg/kg (Rabbit)	= 2410 mg/m³, 3-4 hrs

Sensitization Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Mutagenic effects Contains an known or suspected mutagen.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Glyoxal	460 - 680 mg/L LC50 Leuciscus idus 96 h = 215 mg/L LC50 Pimephales promelas 96 h	<= 348.59 mg/L EC50 Pseudokirchneriella subcapitata 96 h > 500 mg/L EC50 Desmodesmus subspicatus 96 h > 500 mg/L EC50 Desmodesmus subspicatus 72 h	= 404 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

The product contains substances which are not expected to be biodegradable. See component information below.

Chemical Name	Persistence and degradability
Glyoxal	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Glyoxal	Not likely to bioaccumulate - Bioconcentration factor (BCF) 2.155

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
Glyoxal	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Glyoxal	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-May-2017
Revision date	12-Mar-2021
Version	7
This SDS has been revised in the following section(s)	1, 4, 6, 7, 8, 10, 12, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D139
Version 3
Revision date 05-Sep-2017
Supersedes date 01-Jun-2011

Safety Data Sheet
Foamed Cement Stabilizer D139

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Foamed Cement Stabilizer D139
Product code D139
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Specific target organ toxicity - Single exposure	Category 2

Environmental hazards Not classified

Physical Hazards

Flammable Liquids	Category 3

2.2 Label elements

Signal word
WARNING

Hazard Statements
H302 - Harmful if swallowed
H371 - May cause damage to organs
H226 - Flammable liquid and vapor

Precautionary statements
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P270 - Do not eat, drink or smoke when using this product
P309 + P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician
P370 + P378 - In case of fire: Use dry sodium carbonate to extinguish
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P233 - Keep container tightly closed
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing and eye/face protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P330 - Rinse mouth
P403 + P235 - Store in a well-ventilated place. Keep cool

Contains
Methanol

2-(2-Butoxyethoxy)ethanol

Ethylene Glycol

2.3 Other hazards

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT)

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Methanol	200-659-6	67-56-1	1-5
2-(2-Butoxyethoxy)ethanol	203-961-6	112-34-5	0.1-1.0
Ethylene Glycol	203-473-3	107-21-1	0.1-1.0

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get immediate medical attention.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention.

Skin contact Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if irritation persists.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if irritation persists.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Ethanol may be administered in an IV solution to counteract the adverse effects of methanol ingestion. Fomepizole (Antizol) may also be used for treatment of methanol poisoning.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
FLAMMABLE.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Sulphur oxides, Ammonia, Harmful organic

chemical fumes.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG
•3Y

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Keep away from sources of ignition - No smoking. Evacuate and ventilate the area. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage. Do not allow spilled material to enter sewers, storm drains or surface waters.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). After cleaning, flush away traces with water. Ground and bond containers when transferring material. Take precautionary measures against static discharges.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Keep away from heat, sparks and open flame. No smoking. Avoid contact with skin, eyes and clothing. Avoid breathing vapors or mists. Wash thoroughly after handling.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing. When using do not eat, drink, smoke, sniff

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Keep away from heat, sparks, and flame. Ensure adequate ventilation.
Storage precautions	Keep away from open flames, hot surfaces and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place. Follow safe warehousing practices regarding

palletizing, banding, shrink-wrapping and/or stacking.

Storage class Flammable liquid storage.

Packaging materials Steel or high density polyethylene (HDPE) container approved for flammables

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Methanol	250 ppm STEL 328 mg/m³ STEL 200 ppm TWA 262 mg/m³ TWA	250ppmSTEL 328mg/m³STEL 200ppmTWA 262mg/m³TWA	250 ppm STEL 325 mg/m³ STEL Skin designation 200 ppm TWA 260 mg/m³ TWA
2-(2-Butoxyethoxy)ethanol	Not determined	Not determined	Not determined
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	39.4 ppm Ceiling 100 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Methanol	250 ppm STEL; 310 mg/m³ STEL 200 ppm TWA 260 mg/m³ TWA	200 ppm TWA 250 ppm STEL	May cause substantial skin absorption 200 ppm ACL 200 ppm OEL 260 mg/m³ OEL
2-(2-Butoxyethoxy)ethanol	Not determined	Not determined	Not determined
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Methanol	5 mg/m³ MAC	Skin notation 325 mg/m³ STEL 250 ppm STEL	250 ppm STEL 328 mg/m³ STEL 200 ppm TWA 262 mg/m³ TWA Possibility of significant uptake through the skin
2-(2-Butoxyethoxy)ethanol	Not determined	Not determined	Not determined
Ethylene Glycol	5 mg/m³ MAC	100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Methanol	200 ppm TWA 262 mg/m³ TWA Skin notation	200 ppm TWA 260 mg/m³ TWA	15 mg/m³ STEL Skin notation 5 mg/m³ TWA Skin
2-(2-Butoxyethoxy)ethanol	Not determined	Not determined	10 mg/m³ MAC
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Methanol	Not determined	50 mg/m³ TWA 100 mg/m³ STEL	Skin 200 ppm TWA 260 mg/m³ TWA
2-(2-Butoxyethoxy)ethanol	Not determined	Not determined	15 ppm STEL 101.2 mg/m³ STEL 10 ppm TWA 67.5 mg/m³ TWA
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA

			52 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 resistant to the solvent(s) in use Repeated or prolonged contact Nitrile or Neoprene™ Break through time >480 minutes Glove thickness >0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No special protective equipment required. In case of insufficient ventilation: Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing and gloves Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Keep airborne concentrations below exposure limits Avoid contact with skin, eyes and clothing

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Transparent
Odor	Sweet Alcohol
Color	Clear Pale yellow
Odor threshold	No information available

Property	**Values**	**Remarks**
pH	7.6	
pH @ dilution		
Melting / freezing point	< -29 °C / -20 °F	
Boiling point/range	No information available	
Flash point	54 °C / 129 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	

Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	8.1 kPa	@ 38 °C
Vapor density	No information available	
Specific gravity	1.1	@ 20 °C
Bulk density	No information available	
Relative density	1.1	@ 20°C.
Water solubility	Soluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	~5
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Flammable liquid and vapor.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid contact with heat, sparks, open flame, and static discharge.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapors inhaled in high concentration have a narcotic effect on the central nervous system.

Eye contact Contact with eyes may cause irritation. May cause pain, redness, discomfort.

Skin contact Components of the product may be absorbed into the body through the skin. Repeated exposure may cause skin dryness or cracking.

Ingestion Harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May cause adverse cardiac effects, blood disturbances, and metabolic acidosis. Intoxication can lead to a coma with metabolic acidosis that may be fatal.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methanol	= 2528 mg/kg (Rat)	= 15800 mg/kg (Rabbit)	= 128.2 mg/L (Rat) 4 h
2-(2-Butoxyethoxy)ethanol	= 5660 mg/kg (Rat)	= 2700 mg/kg (Rabbit)	No data available
Ethylene Glycol	= 7712 mg/kg (Rat)	> 3500 mg/kg (Mouse)	> 2.5 mg/l (Rat) 6 hour

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Ingestion. Skin contact. Eye contact.

Routes of entry Skin absorption. Eye contact. Ingestion. Inhalation.

Specific target organ toxicity - Single exposure Category 2

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Optic nerve (nervus opticus). Central nervous system.

Aspiration hazard Not classified.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Methanol	= 15400 mg/L (LC50; Lepomis macrochirus)	=22000 mg/l 96 h	>10000 mg/l 48 h
2-(2-Butoxyethoxy)ethanol	= 1300 mg/L LC50 Lepomis macrochirus 96 h	> 100 mg/L EC50 Desmodesmus subspicatus 96 h	= 2850 mg/L EC50 Daphnia magna 24 h > 100 mg/L EC50 Daphnia magna 48 h
Ethylene Glycol	40000 - 60000 mg/L LC50 (Pimephales promelas) = 96 h 40761 mg/L LC50 (Oncorhynchus mykiss) = 96 h 27540 mg/L LC50 (Lepomis macrochirus) = 96 h 14 - 18 mL/L LC50 (Oncorhynchus mykiss) = 96 h 16000 mg/L LC50 (Poecilia reticulata) = 96 h 41000 mg/L LC50 (Oncorhynchus mykiss) = 96 h	6500 - 13000 mg/L EC50 (Pseudokirchneriella subcapitata) = 96 h	46300 mg/L EC50 (Daphnia magna) = 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Methanol	Readily biodegradable
2-(2-Butoxyethoxy)ethanol	Readily biodegradable
Ethylene Glycol	Readily biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Methanol	Does not bioaccumulate
2-(2-Butoxyethoxy)ethanol	Not likely to bioaccumulate
Ethylene Glycol	log Pow -1.36(Calculated) Not likely to bioaccumulate

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Chemical Name	Mobility

Methanol	Easily soluble
2-(2-Butoxyethoxy)ethanol	Completely soluble

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Methanol	Adsorbs on soil Test Koc: 1 Notes: Calculated data (in silico)
2-(2-Butoxyethoxy)ethanol	Henry's Law Constant H = 15.2E-9 atm.m3/mol at 25C (estimated)

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal. Empty containers may contain flammable or explosive vapors. Dispose of in accordance with local regulations.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN1993
UN No. (IMDG/ANTAQ) UN1993
UN No. (ICAO/ANAC) UN1993

14.2. UN proper shipping name
FLAMMABLE LIQUID, N.O.S. (contains methanol),

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class 3
IMDG/ANTAQ Hazard class 3
ICAO/ANAC Hazard class/division 3

14.4 Packing group
ADR/RID/ADN/ADG Packing group III
IMDG/ANTAQ Packing group III
ICAO/ANAC Packing group III

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	30
EmS (IMDG)	F-E, S-E
Emergency Action Code (EAC)	3Y
Tunnel restriction code	(D/E)
Hazchem code ADG	•3Y

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Methanol
Schedule 6
Schedule 5
2-(2-Butoxyethoxy)ethanol
Schedule 5
Ethylene Glycol
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies

Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes date	01-Jun-2011
Revision date	05-Sep-2017
Version	3
This SDS has been revised in the following section(s)	This SDS has been made in a new database and therefore a new layout. There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
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SDS no. PID16796
Version 3
Revision date 08-Jan-2019
Supersedes Date: 02-Feb-2015

Safety Data Sheet
FORM-A-BLOK*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FORM-A-BLOK*
Product code PID16796

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd / ALPINE
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Wollastonite (Ca(SiO3))

Cellulose

Kaolin

Polyvinyl alcohol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Wollastonite (Ca(SiO3))	237-772-5	13983-17-0	30-60
Cellulose	232-674-9	9004-34-6	10-30
Kaolin	310-194-1	1332-58-7	5-10
Polyvinyl alcohol	polymer	9002-89-5	5-10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Suspended dust may present a dust explosion hazard Protect from moisture Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Wollastonite (Ca(SiO3))	Not determined	10mg/m³TWAinhalable dust	Not determined
Cellulose	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Kaolin	75 ppm STEL 356 mg/m³ STEL 50 ppm TWA 238 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Polyvinyl alcohol	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Wollastonite (Ca(SiO3))	Not determined	Not determined	Not determined
Cellulose	Not determined	10 mg/m³ TWA	Not determined
Kaolin	Not determined	2 mg/m³ TWA	Not determined
Polyvinyl alcohol	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Wollastonite (Ca(SiO3))	Not determined	Not determined	Not determined
Cellulose	2 mg/m³ MAC	Not determined	10 mg/m³ TWA
Kaolin	Not determined	Not determined	10 mg/m³ TWA 2 mg/m³ TWA
Polyvinyl alcohol	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Wollastonite (Ca(SiO3))	Not determined	Not determined	Not determined
Cellulose	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Kaolin	2 mg/m³ TWA	Not determined	Not determined
Polyvinyl alcohol	Not determined	Not determined	10 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Wollastonite (Ca(SiO3))	Not determined	Not determined	Not determined
Cellulose	Not determined	10 mg/m³ TWA 5 mg/m³ TWA 20 mg/m³ STEL	Not determined
Kaolin	Not determined	Not determined	Not determined
Polyvinyl alcohol	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable

Respiratory protection — No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.98	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available

VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Wollastonite (Ca(SiO3))	No data available	No data available	No data available

Cellulose	> 5 g/kg (Rat)	> 2 g/kg (Rabbit)	> 5800 mg/m³ (Rat) 4 h
Kaolin	No data available	No data available	No data available
Polyvinyl alcohol	= 23854 mg/kg (Rat) > 20 g/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Wollastonite (Ca(SiO3))	No information available	No information available	No information available
Cellulose	No information available	No information available	No information available
Kaolin	No information available	No information available	No information available
Polyvinyl alcohol	No information available	No information available	No information available

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-Feb-2015
Revision date	08-Jan-2019
Version	3
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID20006
Version 2
Revision date 08-Jan-2019
Supersedes Date: 08-Dec-2015

Safety Data Sheet
FORM-A-BLOK* AS

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FORM-A-BLOK* AS
Product code PID20006

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Magnesium oxide, Sulphur oxides, Silicon oxide.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Avoid dust formation. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning,

flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Strong acids Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No protective equipment is needed under normal use conditions In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3

	(European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid powder
Appearance	Opaque
Odor	Slight Aromatic
Color	Gray - White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.5 - 2.6	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available

Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong acids. Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil

No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	08-Dec-2015
Revision date	08-Jan-2019
Version	2
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID646
Version 4
Revision date 27-Feb-2019
Supersedes Date: 23-Dec-2014

Safety Data Sheet
FORM-A-PLUG* ACC

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FORM-A-PLUG* ACC
Product code PID646

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Magnesium oxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Magnesium oxide	215-171-9	1309-48-4	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
The product reacts with water and will generate heat.

Hazardous combustion products
Fire or high temperatures create: Magnesium oxide, Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Reacts with water.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with water and moist air - product is hygroscopic. Reacts with water Avoid contact with: Acids Oxidizing agents Interhalogens. Phosphorus pentachloride

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Magnesium oxide	10 mg/m³ TWA	10mg/m³TWAfume	10 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Magnesium oxide	Not determined	10 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Magnesium oxide	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Magnesium oxide	10 mg/m³ TWA	15 mg/m³ TWA	4 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Magnesium oxide	Not determined	5 mg/m³ TWA 10 mg/m³ STEL	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may

be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Neoprene Nitrile PVC Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181)
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Off-white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	10.5	@ 1%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.0	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	No information available	

Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	Not determined

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid contact with water and moist air - product is hygroscopic.

10.5 Incompatible materials

Water. Acids. Oxidizing agents. Interhalogens. Phosphorus pentachloride.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

LD50 Oral	4287 mg/kg (rat) estimated
LD50 Dermal	14290 mg/kg (rat) estimated
LC50 Inhalation	25110 mg/l (mist) (dust) mg/m³ estimated

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Magnesium oxide	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Magnesium oxide	No information available	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Magnesium oxide	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Magnesium oxide	Product/Substance is inorganic

12.4 Mobility

Mobility
Slightly soluble in water. See component information below.

Chemical Name	Mobility
Magnesium oxide	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Magnesium oxide	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies

Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	23-Dec-2014
Revision date	27-Feb-2019
Version	4
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID650
Version 3
Revision date 03-Jun-2019
Supersedes Date: 01-Apr-2015

Safety Data Sheet
FORM-A-SET* RET

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FORM-A-SET* RET
Product code PID650
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established.
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment
Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	6.95 - 7.05	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	105 °C / 221 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.31 - 1.34	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	01-Apr-2015
Revision date	03-Jun-2019
Version	3
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	0
Flammability	0
Physical hazard	0
PPE	E

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SDS no. PID20057
Version 2
Revision date 30-Nov-2020
Supersedes Date: 09-Mar-2016

Safety Data Sheet
FybeCarb*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name FybeCarb*
Product code PID20057
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

–

Contains
Calcium carbonate

Cellulose

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Combustible dust

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium carbonate	207-439-9	471-34-1	60-100
Cellulose	232-674-9	9004-34-6	1-5
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth

to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Ammonia, Silicon oxide.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not breathe dust. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture
Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium carbonate	Not determined	10mg/m^{3}TWAinhalable dust	Not determined
Cellulose	10 mg/m^3 TWA	10mg/m^{3}TWAinhalable dust	Not determined
Crystalline silica (impurity)	0.1 mg/m^3 TWA	0.1mg/m^{3}TWArespirable dust	Not determined

Chemical Name	India	Indonesian	Japan
Calcium carbonate	Not determined	Not determined	Not determined
Cellulose	Not determined	10 mg/m³ TWA	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Cellulose	2 mg/m³ MAC	Not determined	10 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium carbonate	Not determined	Not determined	Not determined
Cellulose	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined
Cellulose	Not determined	10 mg/m³ TWA 5 mg/m³ TWA 20 mg/m³ STEL	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against powders and dusts
Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear gloves according to EN 374 to protect against skin effects from powders
Use protective gloves made of: Nitrile Neoprene
Frequent change is advisable

Respiratory protection
No personal respiratory protective equipment normally required Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more

information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules - Fibers
Odor	Odorless
Color	White - Off-white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.55 - 2.70	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available
Cellulose	> 5 g/kg (Rat)	> 2000 mg/kg (Rabbit) > 2 g/kg (Rabbit)	> 5800 mg/m³ (Rat) 4 h
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available
Cellulose	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium carbonate	Not Applicable - Inorganic chemical.
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium carbonate	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Calcium carbonate	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium carbonate	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam

Supersedes Date: 09-Mar-2016

Revision date 30-Nov-2020

Version	2
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D620
Version 3
Revision date 29-Sep-2020
Supersedes Date: 26-Nov-2019

Safety Data Sheet
GASBLOK* Gas Migration Control Additive D620

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name GASBLOK* Gas Migration Control Additive D620
Product code D620

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin sensitization	Category 1A

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H317 - May cause an allergic skin reaction

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P272 - Contaminated work clothing should not be allowed out of the workplace
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P362 + P364 - Take off contaminated clothing and wash it before reuse

Contains
Propane-1,2-diol

2-methyl-2h-isothiazol-3-one

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Propane-1,2-diol	200-338-0	57-55-6	1-5
2-methyl-2h-isothiazol-3-one	220-239-6	2682-20-4	>0.0015 - <0.01

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if symptoms occur.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, fog, Carbon dioxide (CO_2), foam or dry chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
When heated strongly or burned, oxides of carbon and harmful organic chemical fumes are released

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep at (23°F - 122°F) -5°C - 50°C Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong oxidizing agents Strong acids Strong bases

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Propane-1,2-diol	Not determined	150ppmTWAtotal vapour and	Not determined

		particulates 474mg/m³TWAtotal vapour and particulates 10mg/m³TWAparticulates only	
2-methyl-2h-isothiazol-3-one	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Propane-1,2-diol	Not determined	Not determined	Not determined
2-methyl-2h-isothiazol-3-one	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Propane-1,2-diol	7 mg/m³ MAC	Not determined	150 ppm TWA 474 mg/m³ TWA 10 mg/m³ TWA
2-methyl-2h-isothiazol-3-one	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Propane-1,2-diol	Not determined	Not determined	7 mg/m³ MAC
2-methyl-2h-isothiazol-3-one	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Propane-1,2-diol	Not determined	Not determined	Not determined
2-methyl-2h-isothiazol-3-one	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Neoprene Rubber Nitrile
Break through time >480 minutes
Glove thickness >0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Opaque
Odor	Characteristic
Color	Milky white
Odor threshold	Not applicable

Property	Values	Remarks
pH	8.2	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	98 °C / 208 °F	
Flash point	> 98 °C / > 208 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	23.28 hPa	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.03	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	15.7 mPa s	@ 23 °C
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep at (23°F - 122°F) -5°C - 50°C. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong bases.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact May cause an allergic skin reaction.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Propane-1,2-diol	= 20 g/kg (Rat)	= 20800 mg/kg (Rabbit)	No data available
2-methyl-2h-isothiazol-3-one	232 - 249 mg/kg (Rat) = 120 mg/kg (Rat)	= 200 mg/kg (Rabbit)	= 0.11 mg/L (Rat) 4 h

Sensitization May cause allergic skin reaction.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Inhalation.

Routes of entry Skin contact. Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Propane-1,2-diol	= 710 mg/L LC50 Pimephales promelas 96 h = 51400 mg/L LC50 Pimephales promelas 96 h 41 - 47 mL/L LC50 Oncorhynchus mykiss 96 h = 51600 mg/L LC50 Oncorhynchus mykiss 96 h	= 19000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	> 10000 mg/L EC50 Daphnia magna 24 h > 1000 mg/L EC50 Daphnia magna 48 h
2-methyl-2h-isothiazol-3-one	No information available	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Propane-1,2-diol	Readily biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Propane-1,2-diol	Not likely to bioaccumulate log Kow =-1.07

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-methyl-2h-isothiazol-3-one
Schedule 6

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	26-Nov-2019
Revision date	29-Sep-2020
Version	3
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	X

Disclaimer

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SDS no. D500
Version 3
Revision date 18-Jun-2021
Supersedes Date: 26-Jul-2017

Safety Data Sheet
GASBLOK* LT D500

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name GASBLOK* LT D500
Product code D500

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Gas control agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin sensitization	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H317 - May cause an allergic skin reaction

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P272 - Contaminated work clothing should not be allowed out of the workplace
P362 + P364 - Take off contaminated clothing and wash it before reuse

Contains
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol

Methanol (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Prevent the formation of aerosols.

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	225-208-0	4719-04-4	0.1-<1
Methanol (impurity)	200-659-6	67-56-1	0.1-<1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.
Eye Contact	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Thermal decomposition can lead to release of irritating and toxic gases and vapors.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. If spilled, take caution, as material can cause surfaces to become very slippery. Persons susceptible to allergic reactions should not handle this product. Prevent the formation of vapors, mists and aerosols.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Keep away from direct sunlight. Protect from freezing Keep at 41 - 131°F / 5 - 55°C
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt

2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol (impurity)	250 ppm STEL 328 mg/m³ STEL 200 ppm TWA 262 mg/m³ TWA	250ppmSTEL 328mg/m³STEL 200ppmTWA 262mg/m³TWA	250 ppm STEL 325 mg/m³ STEL Skin designation 200 ppm TWA 260 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Group 1 skin sensitizer
Methanol (impurity)	250 ppm STEL 310 mg/m³ STEL 200 ppm TWA 260 mg/m³ TWA	200 ppm TWA 250 ppm STEL	May cause substantial skin absorption 200 ppm ACL 200 ppm OEL 260 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol (impurity)	5 mg/m³ MAC	260 mg/m³ TWA 200 ppm TWA Skin notation 325 mg/m³ STEL 250 ppm STEL	250 ppm STEL 328 mg/m³ STEL 200 ppm TWA 262 mg/m³ TWA Possibility of significant uptake through the skin
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol (impurity)	200 ppm TWA 262 mg/m³ TWA Skin notation	200 ppm TWA 260 mg/m³ TWA	15 mg/m³ STEL Skin notation 5 mg/m³ TWA Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol (impurity)	Not determined	50 mg/m³ TWA 100 mg/m³ STEL	Skin 200 ppm TWA 260 mg/m³ TWA

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation When working in confined spaces (tanks, containers, etc.), ensure that there is a supply of air suitable for breathing and wear the recommended equipment

Personal protective equipment

Eye protection Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Impervious gloves made of: Nitrile Neoprene Butyl rubber
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used. If there are conditions in which this triazine containing product produces a vapor, a chemical

	respirator with A1 + Formaldehyde and P3 particulate pre-filter combination would be required.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Odorless
Color	Yellow

Property	**Values**	**Remarks**
pH	7 - 9.5	
pH @ dilution	No information available	
Melting / freezing point	-5 °C / 23 °F	
Boiling point/range	> 100 °C / 212 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	2.3 kPa	
Relative Vapor Density	>1 (air = 1)	
Specific gravity	1	@ 20 °C
Bulk density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	<= 2000 mPa s	@ 23 °C
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	
Explosive properties	Not applicable	
Oxidizing properties	None known.	

9.2 Other information

Pour point	No information available

Molecular weight No information available
VOC content(%) No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Keep away from direct sunlight. Protect from freezing. Keep at 41 - 131°F / 5 - 55°C.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product information Methanol is more toxic to humans and primates than to most experimental animals, due to differences in how it is metabolized. Non-primates do not appear to experience the acidosis or vision effects observed in humans and primates.

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact May cause an allergic skin reaction.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	1000 mg/kg (Rat) (BASF AG, 1997)	> 4000 mg/kg (Rat) (BASF AG,1997)	0.371 mg/L (Aerosol) (Rat) (Triazine Taskforce, 2011)
Methanol (impurity)	= 6200 mg/kg (Rat)	= 15840 mg/kg (Rabbit) = 15800 mg/kg (Rabbit)	= 22500 ppm (Rat) 8 h = 64000 ppm (Rat) 4 h

Sensitization	May cause allergic skin reaction.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Inhalation. Ingestion.
Routes of entry	Skin absorption. Inhalation. Ingestion.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	> 168 mg/l LC50 96h Sheepshead Minnow (SLB data)	1.624 mg/l EC50 72h Skeletonema (SLB data)	99.68 mg/l KC50 48h Acartia (SLB data)
Methanol (impurity)	13500 - 17600 mg/L LC50 Lepomis macrochirus 96 h 18 - 20 mL/L LC50 Oncorhynchus mykiss 96 h 19500 - 20700 mg/L LC50 Oncorhynchus mykiss 96 h > 100 mg/L LC50 Pimephales promelas 96 h = 28200 mg/L LC50 Pimephales promelas 96 h	No information available	No information available

12.2 Persistence and degradability

No product level data available.

Chemical Name	Persistence and degradability

2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Readily biodegradable
Methanol (impurity)	Readily biodegradable

12.3 Bioaccumulative potential

No product level data available.

Chemical Name	Bioaccumulation
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not likely to bioaccumulate log Kow <=3
Methanol (impurity)	Not likely to bioaccumulate Bioconcentration factor (BCF) 1-4.5

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Soluble in water
Methanol (impurity)	Soluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Study does not need to be conducted because the substance is readily biodegradable
Methanol (impurity)	Not expected to adsorb on soil

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated

IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Methanol (impurity)
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies Volume restriction.
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	26-Jul-2017
Revision date	18-Jun-2021
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	X

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The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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SDS no. U028
Version 5
Revision date 08-Jun-2018
Supersedes Date: 03-Jun-2014

Safety Data Sheet
Gelling Agent U28 - 30% Active

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Gelling Agent U28 - 30% Active
Product code U028

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a gelling agent in oilfield applications

Uses advised against No information available

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1A

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves and eye/face protection
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P363 - Wash contaminated clothing before reuse
P310 - Immediately call a POISON CENTER or doctor/physician
P390 - Absorb spillage to prevent material damage
P220 - Keep/Store away from combustible materials

Sodium hydroxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium hydroxide	215-185-5	1310-73-2	30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Do NOT induce vomiting. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person. Immediate medical attention is required.
Skin contact	Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.
Eye Contact	Get immediate medical attention. Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye.

4.2. Most important symptoms and effects, both acute and delayed

General advice	Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Heating or fire can release toxic gas.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2R

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store between 15-25 deg. C (59-77 deg. F) Avoid extreme temperatures Store away from incompatibles, Strong acids Halogenated compounds Metals
Storage class	Corrosive storage.
Packaging materials	High density polyethylene (HDPE) drum or can

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

, Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium hydroxide	Not determined	2 mg/m³ Peak	2 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ Ceiling	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ TWA	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium hydroxide	2 mg/m³ TWA	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles / Face-shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Wear protective nitrile rubber gloves
Break through time >480 minutes
Glove thickness 0.35-0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	13.5	
pH @ dilution	No information available	
Melting / freezing point	8 °C / 46 °F	
Boiling point/range	115 °C / 239 °F	
Flash point		
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.3	@20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	75 mPa s	@ 20 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid extreme temperatures. Store at ambient conditions.

10.5 Incompatible materials

Strong acids. Halogenated compounds. Metals. Gives off hydrogen by reaction with metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information Causes severe skin burns and eye damage.

Inhalation Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate.

Eye contact Causes burns. Causes serious eye damage.

Skin contact Corrosive. Causes burns.

Ingestion Can burn mouth, throat, and stomach.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	No data available	1350 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

12.2 Persistence and degradability

This product is expected to be readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of as special waste in compliance with local and national regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1824
UN No. (IMDG/ANTAQ)	UN1824
UN No. (ICAO/ANAC)	UN1824

14.2. UN proper shipping name
SODIUM HYDROXIDE SOLUTION,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	PG II
IMDG/ANTAQ Packing group	PG II
ICAO/ANAC Packing group	PG II

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B

Emergency Action Code (EAC)	2R
Tunnel restriction code	(E)
Hazchem code ADG	2R

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium hydroxide
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	03-Jun-2014
Revision date	08-Jun-2018
Version	5
This SDS has been revised in the following section(s)	1, 2, 8, 11, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	0
Physical hazard	1
PPE	X

Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID11404
Version 7
Revision date 07-Jun-2019
Supersedes Date: 06-Jul-2015

Safety Data Sheet
GELPLEX*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name GELPLEX*
Product code PID11404

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

Silica - crystalline, tridymite (impurity)

Gypsum (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	5-10
Silica - crystalline, tridymite (impurity)	239-487-1	15468-32-3	1-5
Gypsum (impurity)	603-783-2	13397-24-5	1-5

3.2 Mixtures

Not applicable

Comments
Naturally occuring mineral.

The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician	Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Silica - crystalline, tridymite (impurity)	0.05 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Gypsum (impurity)	Not determined	10mg/m³TWAinhalable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Silica - crystalline, tridymite (impurity)	Not determined	0.05 mg/m³ TWA	0.03 mg/m³ OEL
Gypsum (impurity)	Not determined	10 mg/m³ TWA	Not determined

Chemical Name	Kazakhstan	Kuwait	New Zealand
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Silica - crystalline, tridymite (impurity)	1 mg/m³ MAC	0.5 mg/m³ TWA	0.1 mg/m³ TWA
Gypsum (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Silica - crystalline, tridymite (impurity)	0.05 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1178
Gypsum (impurity)	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined
Silica - crystalline, tridymite (impurity)	Not determined	Not determined	Not determined
Gypsum (impurity)	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Neoprene Nitrile Frequent change is advisable

Respiratory protection — No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Light tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	8-10	@ 6% slurry
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.3 - 2.65	
Bulk density	769-833 kg/m³ / 48-52 lb/ft³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	No data available	No data available	No data available
Silica - crystalline, tridymite (impurity)	No data available	No data available	No data available
Gypsum (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h
Silica - crystalline, tridymite (impurity)	No information available	No information available	No information available
Gypsum (impurity)	> 1970 mg/L LC50 Pimephales promelas 96 h = 2980 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 3200 mg/L EC50 Nitscheria linearis 120 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	06-Jul-2015
Revision date	07-Jun-2019
Version	7
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data

www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. PID729
Version 9
Revision date 15-Jun-2018
Supersedes Date: 07-Jul-2015

Safety Data Sheet
GLYDRIL* MC

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name GLYDRIL* MC
Product code PID729

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale control agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	500-012-0	9004-77-7	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Take precautionary measures against static discharges. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**

Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl Neoprene Nitrile
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance No information available
Odor Mild
Color Straw Yellow - Opaque Brown

Odor threshold Not applicable

Property	Values	Remarks
pH	7	
pH @ dilution	No information available	
Melting / freezing point	-35 °C / -31 °F	
Boiling point/range	270 - 355 °C / 518 - 671 °F	
Flash point	110 °C / 230 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	0.0033 hPa	@ 25 °C
Vapor density	No information available	
Specific gravity	1.012	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	7.3 cSt	@ 40 °C
Dynamic viscosity	9.2 - 9.4 mPa s	@ 20 °C
log Pow	Not determined	

Explosive properties Not applicable
Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May cause central nervous system depression.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	2630 mg/kg (Rat)	3540 mg/kg bw (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects None known.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	LC50 >1800 mg/l, 96h Scophthalmus maximus OECD 203	EC50: 2490 mg/l, 72h Selenastrum capricornutum OECD 201	EC50 >3200 mg/l, 48h Daphnia magna OECD 202

12.2 Persistence and degradability

Readily biodegradable.

Chemical Name	Persistence and degradability
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	OECD 301D 76%

12.3 Bioaccumulative potential

Does not bioaccumulate.

Chemical Name	Bioaccumulation
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	log Kow 0.44@20°C

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z. Proper Shipping Name: Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated
New Zealand Hazard Classification Classified

HSNO approval no. HSR003673

Group number 8.3A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 07-Jul-2015

Revision date 15-Jun-2018

Version 9

This SDS has been revised in the following section(s) All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories

National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	1
Physical hazard	0
PPE	J

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SDS no. PID727
Version 5
Revision date 09-Feb-2019
Supersedes Date: 23-Jul-2018

Safety Data Sheet
GLYDRIL* LC

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name GLYDRIL* LC
Product code PID727

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale control agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Repeated or prolonged contact Neoprene Nitrile rubber PVC Break through time >30 minutes Glove thickness 0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Characteristic / Slight
Color	Colorless - Pale yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	5-7	50 gl/ water
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	155-165 °C / 311-329 °F	Closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.98 - 1.1 sg	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	15.5 - 21.0 cSt	@ 40 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.
LD50 Oral	> 2000 mg/kg (rat) By analogy to product with similar composition
Sensitization	This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	23-Jul-2018
Revision date	09-Feb-2019
Version	5
This SDS has been revised in the	All sections No changes with regard to classification have been made.

following section(s)

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID10149
Version 7
Revision date 13-Jun-2019
Supersedes Date: 07-Jul-2015

Safety Data Sheet
GLYDRIL*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name GLYDRIL*
Product code PID10149

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Water

Water

Potassium Chloride

Calcium carbonate

Barite

Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy

Starch

Polyanionic cellulose

Xanthan Gum

Crystalline silica (impurity)

Sodium hydroxide

Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine

Sodium carbonate

Glyoxal

2-aminoethanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium carbonate	207-439-9	471-34-1	0-30
Barite	236-664-5	13462-86-7	5-10

Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	500-012-0	9004-77-7	5-10

Comments
The product contains other ingredients which do not contribute to the overall classification.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards

None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Water	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	10mg/m³TWAinhalable dust	Not determined
Barite	Not determined	Not determined	Not determined
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Starch	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Polyanionic cellulose	Not determined	Not determined	Not determined
Xanthan Gum	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Sodium hydroxide	Not determined	2 mg/m³ Peak	2 mg/m³ Ceiling
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
Sodium carbonate	Not determined	Not determined	Not determined
Glyoxal	Not determined	Not determined	Not determined
2-aminoethanol	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA	6ppmSTEL 15mg/m³STEL 3ppmTWA 7.5mg/m³TWA	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Water	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	Not determined	Not determined
Barite	Not determined	Not determined	Not determined
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Starch	Not determined	10 mg/m³ TWA	Not determined
Polyanionic cellulose	Not determined	Not determined	Not determined
Xanthan Gum	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ Ceiling	2 mg/m³ Ceiling
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Group 1 skin sensitizer
Sodium carbonate	Not determined	Not determined	Not determined
Glyoxal	Not determined	Not determined	Not determined
2-aminoethanol	Not determined	3 ppm TWA Skin notation 6 ppm STEL	3 ppm OEL 7.5 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Water	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Potassium Chloride	5 mg/m³ MAC	Not determined	Not determined
Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Barite	6 mg/m³ MAC	Not determined	Not determined
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined

Starch	Not determined	Not determined	10 mg/m³ TWA
Polyanionic cellulose	10 mg/m³ MAC	Not determined	Not determined
Xanthan Gum	Not determined	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Sodium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
Sodium carbonate	2 mg/m³ MAC	Not determined	Not determined
Glyoxal	Not determined	Not determined	Not determined
2-aminoethanol	0.5 mg/m³ MAC	8.0 mg/m³ TWA 3.0 ppm TWA 15.0 mg/m³ STEL 6.0 ppm STEL	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Water	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	5 mg/m³ MAC
Calcium carbonate	Not determined	Not determined	Not determined
Barite	Not determined	Not determined	6 mg/m³ TWA Fibrogenic substance 0242
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Starch	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Polyanionic cellulose	Not determined	Not determined	10 mg/m³ MAC
Xanthan Gum	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ TWA	Not determined
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
Sodium carbonate	Not determined	Not determined	Skin notation 2 mg/m³ MAC Skin
Glyoxal	Not determined	Not determined	Not determined
2-aminoethanol	3 ppm TWA 7.5 mg/m³ TWA	3 ppm TWA 6 mg/m³ TWA	Skin notation 0.5 mg/m³ MAC Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Water	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined
Barite	Not determined	Not determined	Not determined
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Starch	Not determined	Not determined	Not determined
Polyanionic cellulose	Not determined	Not determined	Not determined
Xanthan Gum	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined
Sodium hydroxide	2 mg/m³ TWA	Not determined	Not determined
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
Sodium carbonate	Not determined	Not determined	Not determined
Glyoxal	Not determined	Not determined	Not determined
2-aminoethanol	3 ppm TWA	8 mg/m³ TWA 15 mg/m³ STEL	3 ppm STEL 7.6 mg/m³ STEL Skin 1 ppm TWA 2.5 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Mild
Color	Light gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	8.0 - 9.5	Conc.solution
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	

Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.1 - 1.4	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapors may irritate throat and respiratory system.

Eye contact May cause slight irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	> 90 mL/kg (Rat)	No data available	No data available
Water	> 90 mL/kg (Rat)	No data available	No data available
Potassium Chloride	= 2600 mg/kg (Rat)	No data available	No data available
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available
Barite	> 15000 mg/kg (Rat)	No data available	No data available
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	2630 mg/kg (Rat)	3540 mg/kg bw (Rabbit)	No data available
Starch	No data available	No data available	No data available
Polyanionic cellulose	= 27000 mg/kg (Rat)	> 2 g/kg (Rabbit)	> 5800 mg/m³ (Rat) 4 h
Xanthan Gum	No data available	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available
Sodium hydroxide	= 325 mg/kg (Rat)	1350 mg/kg (Rabbit)	No data available
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	1000 mg/kg (Rat) (BASF AG, 1997)	> 4000 mg/kg (Rat) (BASF AG,1997)	0.371 mg/L (Aerosol) (Rat) (Triazine Taskforce, 2011)
Sodium carbonate	= 4090 mg/kg (Rat)	No data available	No data available
Glyoxal	= 200 mg/kg (Rat)	= 12700 mg/kg (Rabbit)	= 2410 mg/m³, 3-4 hrs
2-aminoethanol	= 1720 mg/kg (Rat)	= 1000 mg/kg (Rabbit) = 1 mL/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Water	No information available	No information available	No information available
Water	No information available	No information available	No information available
Potassium Chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h
Calcium carbonate	No information available	No information available	No information available
Barite	No information available	No information available	No information available
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	LC50 >1800 mg/l, 96h Scophthalmus maximus OECD 203	EC50: 2490 mg/l, 72h Selenastrum capricornutum OECD 201	EC50 >3200 mg/l, 48h Daphnia magna OECD 202
Starch	No information available	No information available	No information available
Polyanionic cellulose	No information available	No information available	No information available
Xanthan Gum	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	> 168 mg/l LC50 96h Sheepshead Minnow (SLB data)	1.624 mg/l EC50 72h Skeletonema (SLB data)	99.68 mg/l KC50 48h Acartia (SLB data)
Sodium carbonate	310 - 1220 mg/L LC50 Pimephales promelas 96 h = 300 mg/L LC50 Lepomis macrochirus 96 h	= 242 mg/L EC50 Nitzschia 120 h	= 265 mg/L EC50 Daphnia magna 48 h
Glyoxal	460 - 680 mg/L LC50 Leuciscus idus 96 h = 215 mg/L LC50 Pimephales promelas 96 h	<= 348.59 mg/L EC50 Pseudokirchneriella subcapitata 96 h > 500 mg/L EC50 Desmodesmus subspicatus 96 h > 500 mg/L EC50 Desmodesmus subspicatus 72 h	= 404 mg/L EC50 Daphnia magna 48 h
2-aminoethanol	> 200 mg/L LC50 Oncorhynchus mykiss 96 h 114 - 196 mg/L LC50 Oncorhynchus mykiss 96 h 300 - 1000 mg/L LC50 Lepomis macrochirus 96 h = 3684 mg/L LC50 Brachydanio rerio 96 h = 227 mg/L LC50 Pimephales promelas 96 h	= 15 mg/L EC50 Desmodesmus subspicatus 72 h	= 65 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium carbonate	Not Applicable - Inorganic chemical.
Barite	Inorganic compound

Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	OECD 301D 76%
Crystalline silica (impurity)	Inorganic compound
Sodium hydroxide	Inorganic compound
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Readily biodegradable
Glyoxal	Readily biodegradable
2-aminoethanol	Readily biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium carbonate	Product/Substance is inorganic
Barite	Product/Substance is inorganic
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	log Kow 0.44@20°C
Crystalline silica (impurity)	Product/Substance is inorganic
Sodium hydroxide	Product/Substance is inorganic
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not likely to bioaccumulate log Kow <=3
Glyoxal	Not likely to bioaccumulate - Bioconcentration factor (BCF) 2.155
2-aminoethanol	Product does not bioaccumulate due to reaction with water

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Calcium carbonate	Insoluble in water
Barite	Insoluble in water
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Soluble in water
Crystalline silica (impurity)	Insoluble in water
Sodium hydroxide	Soluble in water
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Soluble in water
Glyoxal	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium carbonate	Not expected to adsorb on soil
Barite	Not expected to adsorb on soil
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil
Sodium hydroxide	Not expected to adsorb on soil
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Study does not need to be conducted because the substance is readily biodegradable
Glyoxal	Not expected to adsorb on soil
2-aminoethanol	Study does not need to be conducted because the substance is readily biodegradable

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Potassium Chloride
Schedule 4
Sodium hydroxide
Schedule 6
Schedule 5
Sodium carbonate
Schedule 6
Schedule 5
2-aminoethanol
Schedule 4
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	07-Jul-2015
Revision date	13-Jun-2019
Version	7
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D044
Version 3
Revision date 15-Jan-2020
Supersedes Date: 11-Jun-2015

Safety Data Sheet
Granulated Salt D44

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Granulated Salt D44
Product code D044

Molecular weight 58.44

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Clay control agent in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Sodium chloride	231-598-3	7647-14-5	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Hydrogen chloride, Heating or fire can release toxic gas.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid excessive heat for prolonged periods of time. Avoid contact with: Acids Alkali metals Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	**Arabic**	**Australia**	**Egypt**
Sodium chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium chloride	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium chloride	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium chloride	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Rubber Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Half mask with a

	particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	6 - 8	@ 5 g/l
pH @ dilution	No information available	
Melting / freezing point	801 °C / 1474 °F	
Boiling point/range	1413 °C / 2575 °F	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	No information available	
Specific gravity	2.0-2.3 g/cm3	
Bulk density	1050 - 1300 kg/m^3	
Relative density	2.16 g/cm3	@ 20°C.
Water solubility	360 g/l	@ 20 °C
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	58.44

VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time. Protect from moisture.

10.5 Incompatible materials

Acids. Alkali metals. Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation. Eye contact. Skin contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium chloride	4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	11-Jun-2015
Revision date	15-Jan-2020
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	E

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SDS no. PID686
Version 10
Revision date 24-Sep-2019
Supersedes Date: 11-Dec-2018

Safety Data Sheet
G-SEAL* (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name G-SEAL* (All Grades)
Product code PID686

Synonyms G-SEAL* FINE

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Plugging agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Graphite

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Graphite	231-955-3	7782-42-5	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Take precautionary measures against static discharges. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Suspended dust may present a dust explosion hazard Protect from moisture Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Graphite	2 mg/m³ TWA	3mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Graphite	Not determined	2 mg/m³ TWA	2 mg/m³ OEL 0.5 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Graphite	Not determined	Not determined	3 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Graphite	2 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Graphite	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may

be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used. No personal respiratory protective equipment normally required
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Gray - Black
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	3652 °C / 6605.6 °F	
Boiling point/range	4827 °C / 8720.6 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.19 - 2.26	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	

Solubility in other solvents	No information available
Autoignition temperature	> 500 °C / 932 °F
Decomposition temperature	> 400 °C / 752°F
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Keep away from open flames, hot surfaces and sources of ignition. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Graphite	> 2000 mg/kg Rat OECD 423	No data available	> 2000 mg/m³ Rat OECD 403

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Graphite	LC50 > 100 mg/l, 96h OECD 203	EC50 > 100 mg/l 72h OECD 201	EC50 > 100 mg/l 48h202

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	11-Dec-2018
Revision date	24-Sep-2019
Version	10
This SDS has been revised in the following section(s)	1, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. PID16789
Version 3
Revision date 31-Jul-2017
Supersedes Date: 03-Dec-2014

Safety Data Sheet
G-SEAL* PLUS COARSE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name G-SEAL* PLUS COARSE
Product code PID16789

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Plugging agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Graphite

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Graphite	Listed	Proprietary	10-30
Crystalline silica (impurity)	238-878-4	14808-60-7	0.1 - 1

Comments
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very

slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Oxidizing agents Acids Alkalis

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Graphite	2 mg/m³ TWA	3mg/m³TWArespirable dust	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**

Graphite	Not determined	2 mg/m³ TWA	2 mg/m³ OEL 0.5 mg/m³ OEL
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Graphite	Not determined	Not determined	3 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Graphite	2 mg/m³ TWA	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Graphite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

Respiratory protection — No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Solid
Appearance — Powder Dust

Odor	Odorless
Color	Gray - Black
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	n/a	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.9 - 2.1 sg	@ 20 °C
Bulk density	17.5245 lbs/gal	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Oxidizing agents. Acids. Alkalis.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Graphite	No data available	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Graphite	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil

See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	03-Dec-2014
Revision date	31-Jul-2017
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID12351
Version 5
Revision date 08-Jul-2018
Supersedes Date: 19-Feb-2016

Safety Data Sheet
G-SEAL* PLUS

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name G-SEAL* PLUS
Product code PID12351

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Plugging agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Graphite

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
May cause slight irritation
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Graphite	231-955-3	7782-42-5	5-10
Crystalline silica (impurity)	238-878-4	14808-60-7	< 1

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Suspended dust may present a dust explosion hazard Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Graphite	2 mg/m³ TWA	3mg/m³TWArespirable dust	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Graphite	Not determined	2 mg/m³ TWA	2 mg/m³ OEL 0.5 mg/m³ OEL
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**

Graphite	Not determined	Not determined	3 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Graphite	2 mg/m³ TWA	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Graphite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Solid
Appearance — Powder
Odor — Odorless
Color — Gray - Black
Odor threshold — Not applicable

Property	Values	Remarks
pH	6 - 8	
pH @ dilution	No information available	
Melting / freezing point	3652 °C / 6605.6 °F	
Boiling point/range	4827 °C / 8720.6 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		Not applicable
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.9 - 2.1	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	> 500 °C / >932 °F	
Decomposition temperature	> 400°C / >752°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid dust formation. Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Graphite	No data available	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that

large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Graphite	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated
New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	19-Feb-2016
Revision date	08-Jul-2018
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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HALLIBURTON

SAFETY DATA SHEET

STARCIDE®

Revision Date: 15-Nov-2018 **Revision Number:** 7

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name STARCIDE®

Other means of Identification

Synonyms None

Hazardous Material Number: HB003388

Recommended use of the chemical and restrictions on use

Recommended Use Bactericide

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute inhalation toxicity - vapor	Category 4 - H332
Acute inhalation toxicity - dust/mist	Category 4 - H332
Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373
Acute Aquatic Toxicity	Category 2 - H401
Chronic Aquatic Toxicity	Category 3 - H412

- H251

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H332 - Harmful if inhaled
H317 - May cause an allergic skin reaction
H373 - May cause damage to organs through prolonged or repeated exposure
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements

Prevention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia

3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	60 - 100%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Skin Corr. 1C (H314) Eye Corr. 1 (H318) Skin Sens. 1 (H317) STOT RE 2 (H373) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. Harmful if swallowed. Harmful if inhaled. May cause damage to organs through prolonged or repeated exposure.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid breathing mist. Ensure adequate ventilation. Do NOT consume food, drink, or tobacco in contaminated areas. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in original container. Store away from oxidizers. Store away from acids. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 12 months. Keep Away From Food

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Organic vapor respirator.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not flush into surface water or sanitary sewer system Avoid subsoil penetration

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Colorless to slight yellow
Odor:	Sweet amine	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	10 (0.15%)
Freezing Point / Range	No data available
Melting Point / Range	< -35 °C / -31 °F
Pour Point / Range	No data available
Boiling Point / Range	204 °C / 399.2 °F
Flash Point	> 100 °C / > 212 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	0.014 hPa
Vapor Density	No data available
Specific Gravity	1.049 - 1.069
Water Solubility	Soluble in water
Solubility in other solvents	benzene heptane
Partition coefficient: n-octanol/water	1.89
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	21 mPas @ 20°C
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	186.25
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids. Reducing agents.
10.6. Hazardous decomposition products
Formaldehyde. Oxides of nitrogen. Oxides of sulfur.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. Harmful if swallowed. Harmful if inhaled. May cause damage to organs through prolonged or repeated exposure.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	900 mg/kg (Rat)	-	2 mg/L (Rat, 4 hr, aerosol)

Immediate, delayed and chronic health effects from exposure

Inhalation	Harmful if inhaled. Causes severe respiratory irritation.
Eye Contact	Causes eye burns
Skin Contact	Causes severe burns. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause damage to the upper respiratory tract. Formaldehyde, a suspected carcinogen, is released when heated.

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Causes severe irritation and or burns (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Causes severe irritation and or burns (Rabbit)

Substances	CAS Number	Skin Sensitization
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	May cause sensitization by skin contact (guinea pig)

Substances	CAS Number	Respiratory Sensitization
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	No information available

Substances	CAS Number	Mutagenic Effects
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Causes damage to organs through prolonged or repeated exposure: Gastrointestinal tract (GI) Respiratory system

Substances	CAS Number	Aspiration hazard
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Not applicable

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
Product is not classified as hazardous to the environment.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to	Toxicity to Invertebrates

				Microorganisms	
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	EC50(72 h)=5.7 mg/L (Desmodesmus subspicatus) EC50()=3.35 mg/L (Skeletonema costatum)	LC50(96 h)=135.21 mg/L (Scophthalmus maximus)	EC50: 44 mg/L (activated sludge)	EC50(48 h)=37.9 mg/L (Daphnia magna) EC50(48 h)=4.1 mg/L (Acartia tonsa) NOEC(21 d)=1.3 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Readily biodegradable (69.4% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	Log Pow=-0.11

12.4. Mobility in soil

Substances	CAS Number	Mobility
3, 3'-Methylene bis (5-methyl oxazolidine)	66204-44-2	No information available

12.6. Other adverse effects

Does not contain any organically bound halogen. May not increase the AOX value when discharged from treatment plants or into natural waters.

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN2735
UN proper shipping name: Amines, Liquid, Corrosive, N.O.S. (Contains N, N' -Methylenebis[5-methyl oxazolidine])
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN2735
UN proper shipping name: Amines, Liquid, Corrosive, N.O.S. (Contains N, N' -Methylenebis[5-methyl oxazolidine])
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable
EMS: EmS F-A, S-B

IATA/ICAO

UN Number UN2735

UN proper shipping name:	Amines, Liquid, Corrosive, N.O.S. (Contains N, N' -Methylenebis[5-methyl oxazolidine])
Transport Hazard Class(es):	8
Packing Group:	III
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 15-Nov-2018

Revision Note

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H311 - Toxic in contact with skin
H314 - Causes severe skin burns and eye damage
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H341 - Suspected of causing genetic defects
H350 - May cause cancer
H411 - Toxic to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight

CAS – Chemical Abstracts Service
CLP – REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Classification, Labelling and Packaging of substances and mixtures
EC – European Commission
EC10 – Effective Concentration 10%
EC50 – Effective Concentration 50%
EEC – European Economic Community
ErC50 – Effective Concentration growth rate 50%
IBC Code – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL0 – Lethal Loading 0%
LL50 – Lethal Loading 50%
MARPOL – International Convention for the Prevention of Pollution from Ships
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NOEC – No Observed Effect Concentration
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
PC – Chemical Product category
PEL – Permissible Exposure Limit
ppm – parts per million
PROC – Process category
REACH – REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
STEL – Short Term Exposure Limit
SU – Sector of Use category
TWA – Time-Weighted Average
UN – United Nations
VOC – Volatile Organic Carbon
vPvB – very Persistent and very Bioaccumulative
VLA-ED - time-weighted average values for a whole work shift [Spain valores límite ambientales para la exposición diaria]
NDS - najwyisze dopuszczalne stkienie na stanowisku pracy
SZW - Netherlands Ministry of Social Affairs and Employment
ADR - The European Agreement concerning the International Carriage of Dangerous Goods by Road
AS/NZS 1715 - New Zeland Standard on Selection, use and maintenance of respiratory protective equipment
C - Celsius
EN 149 - European standard on filtering halfmasks to protect against particles
EN 374 - European standard on Protective gloves against chemicals and micro-organisms
FFP - Filtering Facepieces
h - hour
IATA/ICAO - International Air Transport Association / International Civil Aviation Organization
IMDG/IMO - International Maritime Dangerous Goods / International Maritime Organization
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
NDS - OEL-TWA [Poland najwyisze dopuszczalne stkienie na stanowisku pracy]
R/H-phrases - Risk/Hazard-phrases
RID - The European Agreement concerning the International Carriage of Dangerous Goods by Rail
UK - United Kingdom
w/w - weight/weight
VLA-EC - short-time excursion limits [Spain valores límite ambientales para la exposición de corta duración]
MAK - Maximum Workplace Concentration
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

ALDACIDE® G ANTIMICROBIAL

Revision Date: 06-Apr-2021 **Revision Number:** 11

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name ALDACIDE® G ANTIMICROBIAL

Other means of Identification

Synonyms None

Hazardous Material Number: HB003462

Recommended use of the chemical and restrictions on use

Recommended Use Biocide

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute inhalation toxicity - vapor	Category 3 - H331
Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Respiratory Sensitization	Category 1 - H334
Skin Sensitization	Category 1 - H317
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Acute Aquatic Toxicity	Category 1 - H400

Chronic Aquatic Toxicity	Category 3 - H412

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H331 - Toxic if inhaled
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H400 - Very toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P281 - Use personal protective equipment as required
P285 - In case of inadequate ventilation wear respiratory protection

Response
P301+ P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains Substances	**CAS Number**
Glutaraldehyde	111-30-8

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Glutaraldehyde	111-30-8	10 - 30%	Acute Tox. 3 (H301) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) Resp. Sens. 1 (H334) Skin Sens. 1 (H317) STOT SE 3 (H335) Aquatic Acute 1 (H400) Aquatic Chronic 2 (H411)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. May cause allergic respiratory reaction. May cause respiratory irritation. Harmful if swallowed. Toxic if inhaled.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Ensure adequate ventilation. Avoid breathing vapors. Avoid contact with skin, eyes and clothing. Evacuate all persons from the area. Use only competent persons for cleanup.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Ensure adequate ventilation. Avoid breathing vapors. Avoid breathing mist. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store away from alkalis. Store in a well ventilated area. Keep container closed when not in use. Store locked up. Product has a shelf life of 36 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Glutaraldehyde	111-30-8	Not applicable	Ceiling: 0.05 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation. If vapors are strong enough to be irritating to the nose or eyes, the TLV is probably being exceeded and special ventilation or respiratory protection maybe required.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Organic vapor respirator.

Hand Protection Impervious gloves Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear light yellow
Odor:	Sharp	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	3.1-4.5
Freezing Point / Range	(-5) - (-10) °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100.5 °C / 213 °F
Flash Point	No data available
Evaporation rate	0.9
Vapor Pressure	0.2 mmHg
Vapor Density	0.8
Specific Gravity	1.064
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	-0.333
Autoignition Temperature	> 275 °C / > 527 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong acids. Strong alkalis.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation; Ingestion.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. May cause allergic respiratory reaction. May cause respiratory irritation. Harmful if swallowed. Toxic if inhaled.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glutaraldehyde	111-30-8	50 mg/kg (Guinea Pig)	560 µL/kg (Rabbit)	0.28-0.5 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation Toxic if inhaled. Causes severe respiratory irritation. May cause allergic respiratory reaction. Inhalation of vapors may result in skin sensitization.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes severe burns. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders. Lung disorders. Liver disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Glutaraldehyde	111-30-8	Causes severe skin irritation with tissue destruction. (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Glutaraldehyde	111-30-8	Causes severe eye irritation which may damage tissue. (Rabbit)

Substances	CAS Number	Skin Sensitization
Glutaraldehyde	111-30-8	Skin sensitizer in guinea pig.

Substances	CAS Number	Respiratory Sensitization
Glutaraldehyde	111-30-8	May cause sensitization by inhalation

Substances	CAS Number	Mutagenic Effects
Glutaraldehyde	111-30-8	In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Glutaraldehyde	111-30-8	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Glutaraldehyde	111-30-8	Not a confirmed teratogen or embryotoxin.

Substances	CAS Number	STOT - single exposure
Glutaraldehyde	111-30-8	No information available

Substances	CAS Number	STOT - repeated exposure
Glutaraldehyde	111-30-8	May cause disorder and damage to the Kidney

Substances	CAS Number	Aspiration hazard
Glutaraldehyde	111-30-8	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Glutaraldehyde	111-30-8	EC50(72h): 0.61 mg/L (Desmodesmus subspicatus) EC50(72h): 0.5 mg/L (Skeletonema costatum)	LC50(96h): 10 mg/L (Lepomis macrochirus) NOEC(97d): 1.6 mg/L (Oncorhynchus mykiss) LC50(96h): 3.5 mg/L (Oncorhynchus mykiss)	EC50 (17h) 6.65 mg/L (Pseudomonas putida)	EC50(48h): 0.35 mg/L (Daphnia magna) EC50(48h): 0.7 mg/L (Acartia tonsa) NOEC(21d): 0.13 mg/L (Daphnia magna)

			LC50(96h): 60 mg/L (Scophthalmus maximus)		EC50(48h): 0.1 mg/L (Acartia tonsa)

12.2. Persistence and degradability

Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Glutaraldehyde	111-30-8	Readily biodegradable (75% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Glutaraldehyde	111-30-8	-0.36

12.4. Mobility in soil

Substances	CAS Number	Mobility
Glutaraldehyde	111-30-8	Potential for mobility in soil is high (Koc between 50 and 150). Given its very low Henry'sconstant (3.3E-08 atm*m3/mole; 25 °C Measured), volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN3265
UN proper shipping name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Marine Pollutant

IMDG/IMO

UN Number UN3265
UN proper shipping name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Marine Pollutant
EMS: EmS F-A, S-B

IATA/ICAO

UN Number UN3265
UN proper shipping name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Marine Pollutant

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 06-Apr-2021

Revision Note
SDS sections updated:
2
3
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Full text of H-Statements referred to under sections 2 and 3
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H330 - Fatal if inhaled
H331 - Toxic if inhaled
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H400 - Very toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects
H412 - Harmful to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton

representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

ALDACIDE® G ANTIMICROBIAL

Revision Date: 06-Apr-2021 **Revision Number:** 11

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name ALDACIDE® G ANTIMICROBIAL

Other means of Identification

Synonyms None

Hazardous Material Number: HB003462

Recommended use of the chemical and restrictions on use

Recommended Use Biocide

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute inhalation toxicity - vapor	Category 3 - H331
Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Respiratory Sensitization	Category 1 - H334
Skin Sensitization	Category 1 - H317
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Acute Aquatic Toxicity	Category 1 - H400

Chronic Aquatic Toxicity	Category 3 - H412

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H331 - Toxic if inhaled
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H400 - Very toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P281 - Use personal protective equipment as required
P285 - In case of inadequate ventilation wear respiratory protection

Response
P301+ P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains Substances	**CAS Number**
Glutaraldehyde	111-30-8

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Glutaraldehyde	111-30-8	10 - 30%	Acute Tox. 3 (H301) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) Resp. Sens. 1 (H334) Skin Sens. 1 (H317) STOT SE 3 (H335) Aquatic Acute 1 (H400) Aquatic Chronic 2 (H411)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. May cause allergic respiratory reaction. May cause respiratory irritation. Harmful if swallowed. Toxic if inhaled.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Ensure adequate ventilation. Avoid breathing vapors. Avoid contact with skin, eyes and clothing. Evacuate all persons from the area. Use only competent persons for cleanup.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Ensure adequate ventilation. Avoid breathing vapors. Avoid breathing mist. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store away from alkalis. Store in a well ventilated area. Keep container closed when not in use. Store locked up. Product has a shelf life of 36 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Glutaraldehyde	111-30-8	Not applicable	Ceiling: 0.05 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation. If vapors are strong enough to be irritating to the nose or eyes, the TLV is probably being exceeded and special ventilation or respiratory protection maybe required.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Organic vapor respirator.

Hand Protection Impervious gloves Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear light yellow
Odor:	Sharp	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	3.1-4.5
Freezing Point / Range	(-5) - (-10) °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100.5 °C / 213 °F
Flash Point	No data available
Evaporation rate	0.9
Vapor Pressure	0.2 mmHg
Vapor Density	0.8
Specific Gravity	1.064
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	-0.333
Autoignition Temperature	> 275 °C / > 527 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong acids. Strong alkalis.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation; Ingestion.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. May cause allergic respiratory reaction. May cause respiratory irritation. Harmful if swallowed. Toxic if inhaled.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glutaraldehyde	111-30-8	50 mg/kg (Guinea Pig)	560 µL/kg (Rabbit)	0.28-0.5 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation Toxic if inhaled. Causes severe respiratory irritation. May cause allergic respiratory reaction. Inhalation of vapors may result in skin sensitization.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes severe burns. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders. Lung disorders. Liver disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Glutaraldehyde	111-30-8	Causes severe skin irritation with tissue destruction. (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Glutaraldehyde	111-30-8	Causes severe eye irritation which may damage tissue. (Rabbit)

Substances	CAS Number	Skin Sensitization
Glutaraldehyde	111-30-8	Skin sensitizer in guinea pig.

Substances	CAS Number	Respiratory Sensitization
Glutaraldehyde	111-30-8	May cause sensitization by inhalation

Substances	CAS Number	Mutagenic Effects
Glutaraldehyde	111-30-8	In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Glutaraldehyde	111-30-8	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Glutaraldehyde	111-30-8	Not a confirmed teratogen or embryotoxin.

Substances	CAS Number	STOT - single exposure
Glutaraldehyde	111-30-8	No information available

Substances	CAS Number	STOT - repeated exposure
Glutaraldehyde	111-30-8	May cause disorder and damage to the Kidney

Substances	CAS Number	Aspiration hazard
Glutaraldehyde	111-30-8	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Glutaraldehyde	111-30-8	EC50(72h): 0.61 mg/L (Desmodesmus subspicatus) EC50(72h): 0.5 mg/L (Skeletonema costatum)	LC50(96h): 10 mg/L (Lepomis macrochirus) NOEC(97d): 1.6 mg/L (Oncorhynchus mykiss) LC50(96h): 3.5 mg/L (Oncorhynchus mykiss)	EC50 (17h) 6.65 mg/L (Pseudomonas putida)	EC50(48h): 0.35 mg/L (Daphnia magna) EC50(48h): 0.7 mg/L (Acartia tonsa) NOEC(21d): 0.13 mg/L (Daphnia magna)

			LC50(96h): 60 mg/L (Scophthalmus maximus)		EC50(48h): 0.1 mg/L (Acartia tonsa)

12.2. Persistence and degradability

Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Glutaraldehyde	111-30-8	Readily biodegradable (75% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Glutaraldehyde	111-30-8	-0.36

12.4. Mobility in soil

Substances	CAS Number	Mobility
Glutaraldehyde	111-30-8	Potential for mobility in soil is high (Koc between 50 and 150). Given its very low Henry'sconstant (3.3E-08 atm*m3/mole; 25 °C Measured), volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN3265
UN proper shipping name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Marine Pollutant

IMDG/IMO

UN Number UN3265
UN proper shipping name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Marine Pollutant
EMS: EmS F-A, S-B

IATA/ICAO

UN Number UN3265
UN proper shipping name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Marine Pollutant

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 06-Apr-2021

Revision Note
SDS sections updated:
2
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Full text of H-Statements referred to under sections 2 and 3
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H330 - Fatal if inhaled
H331 - Toxic if inhaled
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H400 - Very toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects
H412 - Harmful to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton

representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

SDS no. D076
Version 3
Revision date 04-Jan-2018
Supersedes date 31-Jul-2014

Safety Data Sheet
Hematite Weighting Agent D76

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Hematite Weighting Agent D76
Product code D076

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Hematite (diiron trioxide)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Hematite (diiron trioxide)	215-168-2	1309-37-1	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Seek medical attention if irritation occurs.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid generating or breathing dust. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Do not eat, drink or smoke when using this product.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.
No biological limit allocated

Chemical Name	Arabic	Australia	Egypt
Hematite (diiron trioxide)	5 mg/m³ TWA	5mg/m³TWAfume 10mg/m³TWAinhalable dust	5 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Hematite (diiron trioxide)	5 mg/m³ TWA	5 mg/m³ TWA 10 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Hematite (diiron trioxide)	Not determined	Not determined	10 mg/m³ TWA 5 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Hematite (diiron trioxide)	2 ppm TWA 5 mg/m³ TWA	10 mg/m³ TWA	6 mg/m³ TWA Fibrogenic substance 1004
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Hematite (diiron trioxide)	Not determined	5 mg/m³ TWA 10 mg/m³ STEL	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	It is good practice to wear goggles when handling any chemical Tightly fitting safety goggles
Hand protection	Repeated or prolonged contact Use protective gloves made of: Neoprene Nitrile PVC
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Effective dust mask. Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Musty
Color	Red brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution		
Melting / freezing point	> 1700 °C / 3092 °F	
Boiling point/range	No information available	
Flash point	Not combustible	
Evaporation rate (BuAc =1)		
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	>1 (air=1)	
Specific gravity	4.8-5.0	20 °C
Bulk density	2800 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity		
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	0
Density	5.25 g/cm³ (@25°C)

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid handling causing generation of dust.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See also section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hematite (diiron trioxide)	> 10000 mg/kg (Rat)	No data available	No data available

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This substance has no evidence of mutagenic properties.
Carcinogenicity	This substance has no evidence of carcinogenic properties.
Reproductive toxicity	None known.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	No hazard from product as supplied.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hematite (diiron trioxide)	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Hematite (diiron trioxide)
Schedule 4
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes date	31-Jul-2014
Revision date	04-Jan-2018
Version	3
This SDS has been revised in the	SDS sections updated 1, 2, 8, 15, 16. No changes with regard to classification have been

following section(s) made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **ACETIC ACID**

Revision Date: 27-Aug-2013

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Hazardous according to the criteria of NOHSC, Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name:	ACETIC ACID
Synonyms:	None
Chemical Family:	Organic acid
UN Number:	, UN2790
Dangerous Goods Class:	8
Subsidiary Risk:	None
Hazchem Code:	2P
Poisons Schedule:	S6
Application:	Acid

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	Australia NOHSC	New Zealand WES	ACGIH TLV-TWA

Acetic acid	64-19-7	30 - 60%	TWA: 10 ppm TWA: 25 mg/m^3 STEL: 15 ppm STEL: 37 mg/m^3	STEL: 15 ppm STEL: 37 mg/m^3 TWA: 10 ppm TWA: 25 mg/m^3	TWA: 10 ppm STEL: 15 ppm

Non-Hazardous Substance to Total of 100%

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory burns. May be harmful if swallowed. Combustible.

Risk Phrases R10 Flammable.

R34 Causes burns.

HSNO Classification Not Determined

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons
None known.

Special Exposure Hazards Use water spray to cool fire exposed surfaces. Decomposition in fire may produce toxic gases. Do not allow runoff to enter waterways.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption	Isolate spill and stop leak where safe. Neutralize with lime slurry, limestone, or soda ash. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions	Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.
Storage Information	Store away from alkalis. Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.
Respiratory Protection	Organic vapor/acid gas respirator.
Hand Protection	Impervious rubber gloves. Neoprene gloves. Nitrile gloves. Butyl rubber gloves.
Skin Protection	Full protective chemical resistant clothing.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Clear
Odor:	Acrid
pH:	2.9
Specific Gravity @ 20 C (Water=1):	1.05
Density @ 20 C (kg/l):	1.048
Bulk Density @ 20 C (kg/M3):	Not Determined
Boiling Point/Range (C):	117
Freezing Point/Range (C):	16
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	42
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	5.4
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	16
Vapor Pressure @ 20 C (mmHg):	11.7
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	100
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	60.6
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid Keep away from heat, sparks and flame.

Incompatibility (Materials to Avoid) Strong alkalis.

Hazardous Decomposition Products Toxic fumes. Carbon monoxide and carbon dioxide.

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation Causes severe respiratory irritation.

Eye Contact May cause eye burns.

Skin Contact Causes severe burns.

Ingestion Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Acetic acid	64-19-7	3310 mg/kg (Rat) 600 mg/kg (Rabbit)	1060 mg/kg (Rabbit)	11.4 mg/L (Rat) 4 h

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Acetic acid	64-19-7	EC50: 90 mg/L (Microcystis aeruginosa)	LC50: 79 mg/l (Pimephales promelas) LC50: 75 mg/l (Pimephales promelas)	No information available	EC50: 47 mg/l (Daphnia magna) LC50: 32 mg/L (Artemia salina)

Persistence and degradability

Readily biodegradable

Bioaccumulative potential

Does not bioaccumulate

Mobility in soil
No information available

Results of PBT and vPvB assessment
No information available.

Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR

UN2790, Acetic Acid Solution , 8 , III

Air Transportation

ICAO/IATA

UN2790, Acetic Acid Solution , 8 , III
RQ (Acetic Acid - 5683 kg.)

Sea Transportation

IMDG

UN2790, Acetic Acid Solution , 8 , III
RQ (Acetic Acid - 5683 kg.)
EmS F-A, S-B

Other Transportation Information

Labels: Corrosive

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
US TSCA Inventory	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS

Classification C - Corrosive.

Risk Phrases

R10 Flammable.

R34 Causes burns.

Safety Phrases

S23 Do not breathe gas, fumes, vapour or spray.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45 In case of accident or if you feel unwell, seek medical advice immediately.
S1/2 Keep locked up and out of reach of children.

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BE-9**

Revision Date: 21-Dec-2012

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Hazardous according to the criteria of NOHSC, Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: BE-9
Synonyms: None
Chemical Family: Solution
UN Number: , UN2922
Dangerous Goods Class: 6.1
Subsidiary Risk: 8
Hazchem Code: 2X
Poisons Schedule: None
Application: Biocide

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	Australia NOHSC	New Zealand OEL	ACGIH TLV-TWA
Tributyl tetradecyl phosphonium chloride	81741-28-8	5 - 10%	Not applicable	Not applicable	Not applicable

Non-Hazardous Substance to Total of 100%

3. HAZARDS IDENTIFICATION

Hazard Overview

May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed. May be harmful if inhaled.

Risk Phrases

R22 Harmful if swallowed.
R36/38 Irritating to eyes and skin.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

HSNO Classification

Not Determined

4. FIRST AID MEASURES

Inhalation

If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin

Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse. Remove contaminated shoes and discard.

Eyes

In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion

If swallowed, do NOT induce vomiting. Give victim two glasses of water, Call a physician immediately. Never give anything by mouth to an unconscious person.

Notes to Physician

Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Special Exposure Hazards

Decomposition in fire may produce toxic gases. Do not allow runoff to enter waterways. Use water spray to cool fire exposed surfaces.

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures

Use appropriate protective equipment.

Environmental Precautionary Measures

Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Do NOT consume food, drink, or tobacco in contaminated areas.

Storage Information Store in a cool well ventilated area. Keep container closed when not in use. Store away from direct sunlight. Store in a dry location. Store in a manner to prevent commingling with incompatible materials. Store away from alkalis. Store away from reducing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Dust/mist respirator. (N95, P2/P3)

Hand Protection Impervious rubber gloves. Neoprene gloves. Polyvinylchloride gloves.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Clear colorless
Odor:	Slight
pH:	6-8
Specific Gravity @ 20 C (Water=1):	0.95-1.00
Density @ 20 C (kg/l):	0.95-1.00
Bulk Density @ 20 C (kg/m^3):	Not Determined
Boiling Point/Range (C):	100
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Miscible
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

Viscosity, Kinematic @ 20 C (centistokes):	55-65
Partition Coefficient/n-Octanol/Water:	< 3
Molecular Weight (g/mole):	Not Determined
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Reducing agents. Strong alkalis.
Hazardous Decomposition Products	Chlorine. Phosphorus acids. Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation. May be harmful if inhaled.
Skin Contact	May cause skin burns. Harmful if absorbed through the skin.
Eye Contact	May cause eye burns.
Ingestion	May be harmful if swallowed.
Aggravated Medical Conditions	Lung disorders. Skin disorders.
Chronic Effects/Carcinogenicity	Not determined
Other Information	None known.

Toxicity Tests

Oral Toxicity:	LD50: > 2000 mg/kg (Rat)
Dermal Toxicity:	Not determined
Inhalation Toxicity:	LC50: 0.9 mg/l 4-hour (rat) (TTPC)
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Ames test: negative
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Readily biodegradable

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: LC50: (96 hour) 0.46 mg/L (Oncorhynchus mykiss)
LC50: (96 hour) 0.06 mg/l (Lepomis macrochirus)
LC50: (96 hour) 0.58 mg/l (fish)
Acute Crustaceans Toxicity: TLM96: 1.6 mg/l (Crangon crangon) TLM48: 0.025 mg/l (Daphnia magna)
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR

UN2922, Corrosive Liquid, Toxic, N.O.S.(contains Tributyl Tetradecyl Phosphonium Chloride), 8, (6.1), II

Air Transportation

ICAO/IATA

UN2922, Corrosive Liquid, Toxic, N.O.S., 8, (6.1), II
(contains Tributyl Tetradecyl Phosphonium Chloride)

Sea Transportation

IMDG

UN2922, Corrosive Liquid, Toxic, N.O.S.(contains Tributyl Tetradecyl Phosphonium Chloride), 8, (6.1), II
EmS F-A, S-B

Other Transportation Information

Labels: Corrosive
Toxic

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals This product does not comply with NZIOC
US TSCA Inventory All components listed on inventory or are exempt.
EINECS Inventory This product, and all its components, complies with EINECS

Classification	Xi - Irritant. N - Dangerous For The Environment.
Risk Phrases	R22 Harmful if swallowed. R36/38 Irritating to eyes and skin. R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Phrases	S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45 In case of accident or if you feel unwell, seek medical advice immediately. S60 This material and/or its container must be disposed of as hazardous waste. S61 Avoid release to the environment. Refer to special instructions/Safety data sheets. S1/2 Keep locked up and out of reach of children. S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Section 15. Regulatory Information

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.
Disclaimer Statement	This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CLBXTAU121**

Revision Date: 07-Nov-2012

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Non-Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substance or Preparation

Product Trade Name: CLBXTAU121
Synonyms: None
Chemical Family: Organic hydrocarbon
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None
Poisons Schedule: None
Application: Breaker

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substance	CAS Number	Percent	Australia NOHSC	New Zealand OEL	ACGIH TLV-TWA
Citric acid, triethyl ester	77-93-0	60 - 100%	Not determined	Not determined	Not applicable

Non-hazardous Substance to Total of 100%

3. HAZARDS IDENTIFICATION

Hazard Overview No significant hazards expected.

Risk Phrases None

HSNO Classification Non-hazardous

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Get medical attention if irritation persists. Wash with soap and water.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 25 minutes and get medical attention if irritation persists.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Unsuitable Extinguishing Media None known

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use Appropriate protective equipment. Slippery when wet.

Environmental Precautionary Measures Prevent from entering sewers, waterways or low areas.

Procedure for Cleaning/Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Wash hands after use. Avoid contact with eyes, skin, or clothing. Avoid breathing mist. Avoid breathing vapours.

Storage Information Keep from freezing. Store away from oxidisers. Keep container closed when not in use. Store in a well ventilated area. Product has a shelf life of 24 months

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Not normally needed. But if significant exposures are possible then the following respirator is recommended. Dust/mist respirator. (N95,P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Colour:	Light green
Odour:	Odourless
pH:	Not Determined
Specific Gravity @ 20 C (Water=1):	1.14
Density @ 20 C (kg/l):	0.988
Bulk Density @ 20 C (kg/l):	Not Determined
Boiling Point/Range (C):	294
Freezing Point/Range (C):	-45
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	155
Flash Point Method:	CC
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapour Pressure @ 20 C (mmHg):	< 1
Vapour Density (Air=1):	9.54
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate = 1):	Not determined.
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	276.28
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerisation:	Will Not Occur
Conditions to Avoid	None anticipated

Incompatibility (Materials to Avoid)	None known.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause mild respiratory irritation.
Skin Contact	May cause mild skin irritation.
Eye Contact	May cause mild eye irritation.
Ingestion	May cause abdominal pain, vomiting, nausea, and diarrhoea.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	LD50: > 5000 mg/kg (Rat)
Dermal Toxicity:	LD50: > 5000 mg/kg (Rabbit)
Inhalation Toxicity:	LC50: 1300 ppm/6 hr. (Rat)
Primary Irritation Effect:	Not determined
Carcinogenicity:	Not determined
Genotoxicity:	Not determined
Reproductive/Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state and local regulations.

Contaminated Packaging Empty container completely. Transport with all closures in place. Return for reuse or dispose in a sanitary landfill according to national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory	All components listed.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
US TSCA Inventory	All components listed.
EINECS Inventory	All components are listed on the inventory.

Classification Not Determined

Risk Phrases None

Safety Phrases None

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS:
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Product Stewardship at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CLLAU301**

Revision Date: 20-Aug-2012

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substance or Preparation

Product Trade Name: CLLAU301
Synonyms: None
Chemical Family: Inorganic Blend
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None
Poisons Schedule: S6
Application: Crosslinker

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substance	CAS Number	Percent	Australia NOHSC	New Zealand WES	ACGIH TLV-TWA
Inorganic salt	Proprietary	5 - 10%	TWA: 2 mg/m^3	TWA: 2 mg/m^3	2 mg/m^3

2. COMPOSITION/INFORMATION ON INGREDIENTS

Sulfuric acid	7664-93-9	1 - 5%	TWA: 1 mg/m^3 STEL: 3 mg/m^3	TWA: 1 mg/m^3	TWA: 0.2 mg/m^3

Non-hazardous Substance to Total of 100%

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin and respiratory irritation.

Risk Phrases

R36/38 Irritating to eyes and skin.

HSNO Classification 6.1E Acutely Toxic Substances 6.3A Irritating to the skin 6.4A Irritating to the eye 8.1A Corrosive to metals 9.1D Slightly harmful in the aquatic environment

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media All standard fire fighting media

Unsuitable Extinguishing Media None known

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use Appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways or low areas.

Procedure for Cleaning/Absorption Isolate spill and stop leak where safe. Neutralise with lime slurry, limestone, or soda ash. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing mist.

Storage Information Store in a cool, dry location. Product has a shelf life of 24 months

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area.
Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Not normally needed. But if significant exposures are possible then the following respirator is recommended. Dust/mist respirator. (N95,P2/P3)
Hand Protection	Impervious rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Colour:	White
Odour:	Odourless
pH:	0.80
Specific Gravity @ 20 C (Water=1):	1.01
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/l):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapour Pressure @ 20 C (mmHg):	Not Determined
Vapour Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate = 1):	Not determined.
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerisation:	Will Not Occur

Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong alkalis
Hazardous Decomposition Products	Oxides of sulphur.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Inhalation	May cause respiratory irritation.
Skin Contact	May cause skin irritation.
Eye Contact	May cause severe eye irritation.
Ingestion	In large amounts: May cause abdominal pain, vomiting, nausea, and diarrhoea.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	Contains sulphuric acid, a potential carcinogen.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined.
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity:	Not determined
Genotoxicity:	Not determined
Reproductive/Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not applicable
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory	All components listed.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
US TSCA Inventory	All components listed.
EINECS Inventory	All components are listed on the inventory.

Classification Xi - Irritant.

Risk Phrases

R36/38 Irritating to eyes and skin.

Safety Phrases

S23 Do not breathe gas, fumes, vapour or spray.
S24/25 Avoid contact with skin and eyes.

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS:
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Product Stewardship at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **FDP-S1085-13**

Revision Date: 21-Feb-2013

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: FDP-S1085-13
Synonyms: None
Chemical Family: Polymer Blend
Application: Scale Inhibitor

Manufacturer/Supplier
Halliburton Energy Services, Inc.
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Polyacrylate		10 - 30%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and skin irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	> 200**Min:** > 200
Flash Point/Range (C):	> 93.3**Min:** > 95
Flash Point Method:	ASTM D3278-78
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media. Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0 , PPE: B

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing.

Storage Information Store away from oxidizers. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally necessary.

Hand Protection Butyl rubber gloves.

Skin Protection Normal work coveralls.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Clear
Odor:	Mild
pH:	5.7 - 5.9
Specific Gravity @ 20 C (Water=1):	1.137

9. PHYSICAL AND CHEMICAL PROPERTIES

Density @ 20 C (lbs./gallon):	9.47
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	~ 80
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide. Toxic monomer fumes.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye and skin contact.
Inhalation	May cause respiratory irritation.
Skin Contact	May cause skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	Irritation of the mouth, throat, and stomach.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **FE-2**

Revision Date: 04-Jan-2011

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
53-55 Bannister Road
Canning Vale
WA 6155
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: FE-2
Synonyms: None
Chemical Family: Organic acid
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None
Poisons Schedule: None
Application: Iron Control Agent

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	Australia NOHSC	ACGIH TLV-TWA
Citric acid	77-92-9	60 - 100%	Not applicable	Not applicable

Total to 100%

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

Hazard Ratings

Flammability:	0
Toxicty:	0
Body Contact:	1
Reactivity:	0
Chronic:	0

Scale: Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons None known.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from alkalis. Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area.
Respiratory Protection	Dust/mist respirator. (95%)
Hand Protection	Impervious rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	White
Odor:	Odorless
pH:	1.8
Specific Gravity @ 20 C (Water=1):	1.665
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/m^3):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	1000
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	8
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	65
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	0
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	192.13
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong alkalis. Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Inhalation May cause respiratory irritation.

Skin Contact May cause skin irritation.

Eye Contact May cause severe eye irritation.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Aggravated Medical Conditions None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Other Information None known.

Toxicity Tests

Oral Toxicity: LD50: 11700 mg/kg (Rat)

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Biodegradable

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: TLM96: 100-330 ppm (Crangon crangon)

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory All components listed.
US TSCA Inventory All components listed on inventory or are exempt.
EINECS Inventory This product, and all its components, complies with EINECS

Classification Xi - Irritant.

Risk Phrases R36 Irritating to eyes.

Safety Phrases

S24/25 Avoid contact with skin and eyes.

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

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*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **FR-50D**

Revision Date: 05-Nov-2013

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Non-Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: FR-50D
Synonyms: None
Chemical Family: Salt Polymer Blend
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None Allocated
Poisons Schedule: None Allocated
Application: Friction Reducer

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	Australia NOHSC	New Zealand WES	ACGIH TLV-TWA
Salt	Proprietary	60 - 100%	Not applicable	Not applicable	Not applicable

Non-Hazardous Substance to Total of 100%

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

Risk Phrases None

HSNO Classification 6.1E Acutely Toxic Substances
6.4A Irritating to the eye

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media
All standard fire fighting media

Extinguishing media which must not be used for safety reasons
None known.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ground and bond containers when transferring from one container to another. Slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Keep from heat, sparks, and open flames. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

HEPA Respirator.

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	White
Odor:	Slight
pH:	9 (.5%)
Specific Gravity @ 20 C (Water=1):	2.0
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/M3):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid None anticipated

Incompatibility (Materials to Avoid) Strong oxidizers.

Hazardous Decomposition Products Carbon monoxide and carbon dioxide. Ammonia.

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation May cause respiratory irritation.

Eye Contact Causes eye irritation.

Skin Contact May cause skin irritation.

Ingestion Large doses may cause nausea, vomiting and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Salt	Proprietary	3 g/kg (Rat)	10 g/kg (Rabbit)	42 g/m³ (Rat) 1 h

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: LC50 (96): > 100 mg/l

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Salt	Proprietary	No information available	TLM96: > 1000 mg/l (Oncorhynchus mykiss)	No information available	TLM96: > 1,000,000 ppm (Mysidopsis bahia)

12.2 Persistence and degradability

No information available

12.3 Bioaccumulative potential

No information available

12.4 Mobility in soil

No information available

12.5 Results of PBT and vPvB assessment
No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	This product does not comply with NZIOC
US TSCA Inventory	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
Classification	Not Classified
Risk Phrases	None
Safety Phrases	None

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

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*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HAI-150E**

Revision Date: 27-Aug-2013

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Non-Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: HAI-150E
Synonyms: None
Chemical Family: Blend
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None Allocated
Poisons Schedule: None Allocated
Application: Corrosion Inhibitor

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	Australia NOHSC	New Zealand WES	ACGIH TLV-TWA
Contains no hazardous substances	Mixture	60 - 100%	Not applicable	Not applicable	Not applicable

Non-Hazardous Substance to Total of 100%

3. HAZARDS IDENTIFICATION

Hazard Overview	May cause eye, skin, and respiratory irritation.
Risk Phrases	None
HSNO Classification	Non-hazardous

4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Get medical attention if irritation persists. Wash with soap and water.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Notes to Physician	Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media
All standard fire fighting media

Extinguishing media which must not be used for safety reasons
None known.

Special Exposure Hazards	Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment.
Environmental Precautionary Measures	None known.
Procedure for Cleaning / Absorption	Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions	Avoid creating or inhaling dust.
Storage Information	Store away from oxidizers. Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	A well ventilated area to control dust levels.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Brown
Odor:	Coffee bean
pH:	Not Determined
Specific Gravity @ 20 C (Water=1):	Not Determined
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/M3):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.

Hazardous Decomposition Products Carbon monoxide and carbon dioxide.

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation May cause mild respiratory irritation.

Eye Contact May cause mild eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion None known

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards. Generally Recognized As Safe (GRAS)

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances	Mixture	No data available	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Contains no hazardous substances	Mixture	No information available	No information available	No information available	No information available

Persistence and degradability

Product is biodegradable

Bioaccumulative potential

Does not bioaccumulate

Mobility in soil

No information available

Results of PBT and vPvB assessment

No information available.

Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
US TSCA Inventory	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
Classification	Not Classified
Risk Phrases	None
Safety Phrases	None

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

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*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HYDROCHLORIC ACID**

Revision Date: 04-Jan-2010

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Hazardous according to the criteria of NOHSC, Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
53-55 Bannister Road
Canning Vale
WA 6155
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: HYDROCHLORIC ACID
Synonyms: None
Chemical Family: Inorganic acid
UN Number: , UN1789
Dangerous Goods Class: 8
Subsidiary Risk: None
Hazchem Code: 2R
Poisons Schedule: S6
Application: Solvent

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	Australia NOHSC	ACGIH TLV-TWA
Hydrochloric acid	7647-01-0	30 - 60%	5 ppm	2 ppm

Total to 100%

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory burns. May be harmful if swallowed.

Hazard Ratings

Flammability:	0
Toxicty:	2
Body Contact:	3
Reactivity:	0
Chronic:	0

Scale: Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons None known.

Special Exposure Hazards May form explosive mixtures with strong alkalis. Decomposition in fire may produce toxic gases. Reaction with steel and certain other metals generates flammable hydrogen gas. Do not allow runoff to enter waterways.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Storage Information Store away from alkalis. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Acid gas respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Full protective chemical resistant clothing. Rubber boots.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Clear colorless
Odor:	Pungent acrid
pH:	0.8
Specific Gravity @ 20 C (Water=1):	1.18
Density @ 20 C (kg/l):	1.16
Bulk Density @ 20 C (kg/m^3):	Not Determined
Boiling Point/Range (C):	110
Freezing Point/Range (C):	-46
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapor Pressure @ 20 C (mmHg):	26
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	35
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	36.5
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid None anticipated

Incompatibility (Materials to Avoid)	Strong alkalis.
Hazardous Decomposition Products	Flammable hydrogen gas. Chlorine. Hydrogen sulfide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Causes severe respiratory irritation.
Skin Contact	May cause skin burns.
Eye Contact	May cause eye burns.
Ingestion	Causes burns of the mouth, throat and stomach.
Aggravated Medical Conditions	Skin disorders.
Chronic Effects/Carcinogenicity	Prolonged, excessive exposure may cause erosion of the teeth.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	LC50: 3124 ppm/1 hr. (Rat)
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR

UN1789,Hydrochloric Acid Solution, 8, II

Air Transportation

ICAO/IATA

UN1789,Hydrochloric Acid Solution, 8, IIRQ (Hydrochloric Acid - 2273 kg.)

Sea Transportation

IMDG

UN1789,Hydrochloric Acid Solution, 8, IIRQ (Hydrochloric Acid - 2273 kg.)
EmS F-A, S-B

Other Shipping Information

Labels: Corrosive

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory All components listed.
US TSCA Inventory All components listed on inventory or are exempt.
EINECS Inventory This product, and all its components, complies with EINECS

Classification C - Corrosive.

Risk Phrases
R34 Causes burns.
R37 Irritating to respiratory system.

Safety Phrases
S9 Keep container in a well ventilated place.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45 In case of accident or if you feel unwell, seek medical advice immediately.
S1/2 Keep locked up and out of reach of children.
S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **TLC-W3 - ROCK SALT**

Revision Date: 04-Jan-2011

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Non-Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
53-55 Bannister Road
Canning Vale
WA 6155
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: TLC-W3 - ROCK SALT
Synonyms: None
Chemical Family: Inorganic Salt
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None
Poisons Schedule: None
Application: Additive

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	Australia NOHSC	ACGIH TLV-TWA
Sodium chloride	7647-14-5	60 - 100%	Not applicable	Not applicable

Total to 100%

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

Hazard Ratings

Flammability:	0
Toxicty:	0
Body Contact:	0
Reactivity:	0
Chronic:	0

Scale: Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media All standard fire fighting media

Extinguishing media which must not be used for safety reasons None known.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (95%)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	White
Odor:	Odorless
pH:	Not Determined
Specific Gravity @ 20 C (Water=1):	2.16
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/m^3):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	58.44
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	None known.
Hazardous Decomposition Products	None known.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Inhalation May cause respiratory irritation.

Skin Contact Prolonged or repeated contact may cause skin irritation.

Eye Contact May cause eye irritation.

Ingestion None known

Aggravated Medical Conditions None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Other Information None known.

Toxicity Tests

Oral Toxicity: LD50: 3000 mg/kg (Rat)

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not applicable

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory	All components listed.
US TSCA Inventory	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
Classification	Not Classified
Risk Phrases	None
Safety Phrases	None

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CLWGAU421**

Revision Date: 05-Sep-2012

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Non-Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier

Halliburton/Baroid Australia Pty. Ltd.
53-55 Bannister Road
Canning Vale
WA 6155
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
New Zealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: CLWGAU421
Synonyms: None
Chemical Family: Carbohydrate
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None
Poisons Schedule: None
Application: Gelling Agent

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	Australia NOHSC	New Zealand OEL	ACGIH TLV-TWA
Polysaccharide		60 - 100%	Not applicable	Not applicable	Not applicable

Non-Hazardous Substance to Total of 100%

3. HAZARDS IDENTIFICATION

Hazard Overview	May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.
Risk Phrases	None
HSNO Classification	9.1C Substances that are harmful in the aquatic environment.

4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.
Notes to Physician	Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media	Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons	None known.
Special Exposure Hazards	Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Avoid creating and breathing dust. Slippery when wet.
Environmental Precautionary Measures	None known.
Procedure for Cleaning / Absorption	Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions	Wash hands after use. Launder contaminated clothing before reuse. Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid dust accumulations. Slippery when wet. Ground and bond containers when transferring from one container to another.

Storage Information Store in a well ventilated area. Store away from oxidizers. Keep container closed when not in use. Store in a cool, dry location. Keep from heat, sparks, and open flames. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	White to off white
Odor:	Odorless
pH:	6.5-8 (1%)
Specific Gravity @ 20 C (Water=1):	1.6
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/m^3):	750
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	> 370
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Forms gel
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause mild respiratory irritation. In high air concentrations: May impede respiration.
Skin Contact	May cause an allergic skin reaction. Prolonged or repeated contact may cause skin irritation.
Eye Contact	May cause mild eye irritation.
Ingestion	May cause allergic reaction.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Readily biodegradable
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals All components listed on inventory or are exempt.
US TSCA Inventory All components listed on inventory or are exempt.
EINECS Inventory This product, and all its components, complies with EINECS

Classification Not Classified

Risk Phrases None

Safety Phrases None

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre
0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **SAND - COMMON BROWN**

Revision Date: 05-Jan-2010

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Hazardous according to criteria of WorkSafe

Manufacturer/Supplier

Halliburton Australia Pty. Ltd.
53-55 Bannister Road
Canning Vale
WA 6155
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: SAND - COMMON BROWN
Synonyms: None
Chemical Family: Sand
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None
Poisons Schedule: None
Application: Proppant

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	Australia NOHSC	ACGIH TLV-TWA
Crystalline silica, quartz	14808-60-7	60 - 100%	0.1 mg/m^3	0.025 mg/m^3

Total to 100%

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

Hazard Ratings

Flammability:	0
Unknown Aquatic Toxicty	0
Body Contact:	0
Reactivity:	0
Chronic:	4

Scale: Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media None - does not burn.

Unsuitable Extinguishing Media None known.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures	None known.
Procedure for Cleaning / Absorption	Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Storage Information	Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Brown
Odor:	Odorless
pH:	Not Determined
Specific Gravity @ 20 C (Water=1):	2.63 - 2.67
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/m^3):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m^3):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m^3):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	0

9. PHYSICAL AND CHEMICAL PROPERTIES

Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	65
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	None known.
Eye Contact	May cause mechanical irritation to eye.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information

For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not applicable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory	Not Determined
US TSCA Inventory	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
Classification	Not Classified
Risk Phrases	None
Safety Phrases	None

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Contact

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand Poisons Information System
Deunedin: -(03) 479 1200 (Normal Hours)
-(03) 474 0999 (Emergency)

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

Tracerco T-140a

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4886-72**
Version No: **3.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-140a
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability	0		
Toxicity	2		
Body Contact	2		
Reactivity	0		
Chronic	0		

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
490-97-1	10-30	sodium 2-fluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.

Continued...

	▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.

Continued...

Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-140a	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

Respiratory protection

Continued...

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-140a

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7

Continued...

Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

	TOXICITY	IRRITATION
Tracerco T-140a	Not Available	Not Available
sodium 2-fluorobenzoate	Not Available	Not Available
water	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-140a	Not available.
SODIUM 2-FLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✔	**Carcinogenicity**	⊘

Continued...

Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 2-fluorobenzoate(490-97-1) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport

Continued...

	Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-140b

Tracerco

Chemwatch Hazard Alert Code: **1**

Chemwatch: **4886-94**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-140b
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

NON-HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	**0**	
Toxicity	**1**	
Body Contact	**1**	
Reactivity	**0**	
Chronic	**0**	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification	Not Applicable

Continued...

Label elements

GHS label elements	Not Applicable
SIGNAL WORD	**NOT APPLICABLE**

Hazard statement(s)

Not Applicable

Precautionary statement(s): Prevention

Not Applicable

Precautionary statement(s): Response

Not Applicable

Precautionary statement(s): Storage

Not Applicable

Precautionary statement(s): Disposal

Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
499-57-0	1-10	sodium 3-fluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Continued...

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.
	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.
Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Continued...

Ingredient	Original IDLH	Revised IDLH
Tracerco T-140b	Not Available	Not Available

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-140b

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available

Continued...

Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	90
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Not normally a hazard due to non-volatile nature of product The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

Tracerco T-140b	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

Continued...

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-140b	Not available.
SODIUM 3-FLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	⦸	**Carcinogenicity**	⦸
Skin Irritation/Corrosion	⦸	**Reproductivity**	⦸
Serious Eye Damage/Irritation	⦸	**STOT - Single Exposure**	⦸
Respiratory or Skin sensitisation	⦸	**STOT - Repeated Exposure**	⦸
Mutagenicity	⦸	**Aspiration Hazard**	⦸

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO

Continued...

HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 3-fluorobenzoate(499-57-0) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-140c

Tracerco

Chemwatch Hazard Alert Code: **1**

Chemwatch: **4886-95**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-140c
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

NON-HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	1	
Body Contact	1	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification	Not Applicable

Continued...

Label elements

GHS label elements	Not Applicable
SIGNAL WORD	**NOT APPLICABLE**

Hazard statement(s)

Not Applicable

Precautionary statement(s): Prevention

Not Applicable

Precautionary statement(s): Response

Not Applicable

Precautionary statement(s): Storage

Not Applicable

Precautionary statement(s): Disposal

Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
499-90-1	1-10	sodium 4-fluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Continued...

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.
	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.
Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Continued...

Ingredient	Original IDLH	Revised IDLH
Tracerco T-140c	Not Available	Not Available

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-140c

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available

Continued...

Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	90
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Not normally a hazard due to non-volatile nature of product The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

Tracerco T-140c	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

Continued...

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-140c	Not available.
SODIUM 4-FLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	⦸	**Carcinogenicity**	⦸
Skin Irritation/Corrosion	⦸	**Reproductivity**	⦸
Serious Eye Damage/Irritation	⦸	**STOT - Single Exposure**	⦸
Respiratory or Skin sensitisation	⦸	**STOT - Repeated Exposure**	⦸
Mutagenicity	⦸	**Aspiration Hazard**	⦸

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO

Continued...

HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 4-fluorobenzoate(499-90-1) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-158a

Tracerco

Chemwatch Hazard Alert Code: **1**

Chemwatch: **4886-96**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-158a
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

NON-HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	1	
Body Contact	1	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification	Not Applicable

Continued...

Label elements

GHS label elements	Not Applicable
SIGNAL WORD	**NOT APPLICABLE**

Hazard statement(s)

Not Applicable

Precautionary statement(s): Prevention

Not Applicable

Precautionary statement(s): Response

Not Applicable

Precautionary statement(s): Storage

Not Applicable

Precautionary statement(s): Disposal

Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
1765-08-8	1-10	sodium 2,4-difluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Continued...

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.
	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.
Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Continued...

Ingredient	Original IDLH	Revised IDLH
Tracerco T-158a	Not Available	Not Available

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-158a

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available

Continued...

Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	90
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Not normally a hazard due to non-volatile nature of product The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

Tracerco T-158a	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

Continued...

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-158a	Not available.
SODIUM 2,4-DIFLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	⦸	**Carcinogenicity**	⦸
Skin Irritation/Corrosion	⦸	**Reproductivity**	⦸
Serious Eye Damage/Irritation	⦸	**STOT - Single Exposure**	⦸
Respiratory or Skin sensitisation	⦸	**STOT - Repeated Exposure**	⦸
Mutagenicity	⦸	**Aspiration Hazard**	⦸

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO

Continued...

HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 2,4-difluorobenzoate(1765-08-8) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-158b

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4886-97**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-158b
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
522651-42-9	10-30	sodium 2,5-difluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.

Continued...

	▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.

Continued...

Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-158b	Not Available	Not Available

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory

Continued...

Tracerco T-158b

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Continued...

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

	TOXICITY	IRRITATION
Tracerco T-158b	Not Available	Not Available
sodium 2,5-difluorobenzoate	Not Available	Not Available
water	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-158b	Not available.
SODIUM 2,5-DIFLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✔	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Continued...

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 2,5-difluorobenzoate(522651-42-9) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the

Continued...

Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-158c

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4886-98**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-158c
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
6185-28-0	10-30	sodium 2,6-difluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.

Continued...

	▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.

Continued...

Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-158c	Not Available	Not Available

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory

Continued...

Tracerco T-158c

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Continued...

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Tracerco T-158c	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
sodium 2,6-difluorobenzoate	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
water	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-158c	Not available.
SODIUM 2,6-DIFLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✔	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Continued...

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 2,6-difluorobenzoate(6185-28-0) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the

Continued...

Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-158d

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4886-99**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-158d
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
522651-44-1	10-30	sodium 3,4-difluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.

Continued...

	▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.

Continued...

Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-158d	Not Available	Not Available

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory

Continued...

Tracerco T-158d

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Continued...

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Tracerco T-158d	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
sodium 3,4-difluorobenzoate	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
water	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-158d	Not available.
SODIUM 3,4-DIFLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✔	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Continued...

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 3,4-difluorobenzoate(522651-44-1) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the

Continued...

Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-176c

Tracerco

Chemwatch Hazard Alert Code: **1**

Chemwatch: **4888-07**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-176c
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

NON-HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	**0**	
Toxicity	**1**	
Body Contact	**1**	
Reactivity	**0**	
Chronic	**0**	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification	Not Applicable

Continued...

Label elements

GHS label elements	Not Applicable
SIGNAL WORD	**NOT APPLICABLE**

Hazard statement(s)

Not Applicable

Precautionary statement(s): Prevention

Not Applicable

Precautionary statement(s): Response

Not Applicable

Precautionary statement(s): Storage

Not Applicable

Precautionary statement(s): Disposal

Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
522651-48-5	<10	sodium 2,4,5-trifluorobenzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Continued...

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	‣ Alert Fire Brigade and tell them location and nature of hazard. ‣ Wear breathing apparatus plus protective gloves in the event of a fire. ‣ Prevent, by any means available, spillage from entering drains or water courses. ‣ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	‣ Non combustible. ‣ Not considered to be a significant fire risk. ‣ Expansion or decomposition on heating may lead to violent rupture of containers. ‣ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	‣ Clean up all spills immediately. ‣ Avoid breathing vapours and contact with skin and eyes. ‣ Control personal contact with the substance, by using protective equipment. ‣ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ‣ Clear area of personnel. ‣ Alert Fire Brigade and tell them location and nature of hazard. ‣ Control personal contact with the substance, by using protective equipment as required.
	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	‣ Limit all unnecessary personal contact. ‣ Wear protective clothing when risk of exposure occurs. ‣ Use in a well-ventilated area. ‣ When handling **DO NOT** eat, drink or smoke.
Other information	‣ Store in original containers. ‣ Keep containers securely sealed. ‣ Store in a cool, dry, well-ventilated area. ‣ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	‣ Polyethylene or polypropylene container. ‣ Packing as recommended by manufacturer. ‣ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Continued...

Ingredient	Original IDLH	Revised IDLH
Tracerco T-176c	Not Available	Not Available

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-176c

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available

Continued...

Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	90
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Not normally a hazard due to non-volatile nature of product The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

Tracerco T-176c	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

Continued...

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-176c	Not available.
SODIUM 2,4,5-TRIFLUOROBENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	⦸	**Carcinogenicity**	⦸
Skin Irritation/Corrosion	⦸	**Reproductivity**	⦸
Serious Eye Damage/Irritation	⦸	**STOT - Single Exposure**	⦸
Respiratory or Skin sensitisation	⦸	**STOT - Repeated Exposure**	⦸
Mutagenicity	⦸	**Aspiration Hazard**	⦸

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO

Continued...

HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 2,4,5-trifluorobenzoate(522651-48-5) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-190a

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4888-08**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-190a
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
2966-44-1	10-30	sodium 2-(trifluoromethyl)benzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.

Continued...

	▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.

Continued...

Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-190a	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

Respiratory protection

Continued...

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-190a

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7

Continued...

Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

	TOXICITY	IRRITATION
Tracerco T-190a	Not Available	Not Available
sodium 2-(trifluoromethyl)benzoate	Not Available	Not Available
water	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-190a	Not available.
SODIUM 2-(TRIFLUOROMETHYL)BENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✔	**Carcinogenicity**	⊘

Continued...

Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 2-(trifluoromethyl)benzoate(2966-44-1) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not

Continued...

	apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-190b

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4888-09**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-190b
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
69226-41-1	10-30	sodium 3-(trifluoromethyl)benzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.

Continued...

	▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.

Continued...

Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-190b	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

Respiratory protection

Continued...

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-190b

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7

Continued...

Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

	TOXICITY	IRRITATION
Tracerco T-190b	Not Available	Not Available
sodium 3-(trifluoromethyl)benzoate	Subcutaneous (Frog) LD50: 848 mg/kg	
	Not Available	Not Available
water	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-190b	Not available.
SODIUM 3-(TRIFLUOROMETHYL)BENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Continued...

Acute Toxicity	✔	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 3-(trifluoromethyl)benzoate(69226-41-1) is found on the following regulatory lists	

Continued...

water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-190c

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4888-10**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-190c
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
25832-58-0	10-30	sodium 4-(trifluoromethyl)benzoate
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.

Continued...

	▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.

Continued...

Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-190c	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

Respiratory protection

Continued...

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-190c

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7

Continued...

Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

	TOXICITY	IRRITATION
Tracerco T-190c	Not Available	Not Available
sodium 4-(trifluoromethyl)benzoate	Not Available	Not Available
water	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-190c	Not available.
SODIUM 4-(TRIFLUOROMETHYL)BENZOATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✔	**Carcinogenicity**	⊘

Continued...

Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sodium 4-(trifluoromethyl)benzoate(25832-58-0) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not

Continued...

	apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Tracerco T-194a

Tracerco

Chemwatch Hazard Alert Code: **2**

Chemwatch: **4888-11**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **25/02/2014**
Print Date: **16/05/2014**
Initial Date: **Not Available**
S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Tracerco T-194a
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions.

Details of the supplier of the safety data sheet

Registered company name	Tracerco		
Address	2 Harris Road Malaga 6090 WA Australia		
Telephone	+61 8 9209 3905		
Fax	+61 8 9209 3725		
Website	www.tracerco.com		
Email	admin.aus@tracerco.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		
Other emergency telephone numbers	+61 8 9209 3905 (9am-5pm)		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the Model WHS Regulations and the ADG Code.

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	1	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
GHS Classification [1]	Skin Corrosion/Irritation Category 2, Eye Irrit. 2, STOT - SE (Resp. Irr.) Category 3

Continued...

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s): Prevention

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s): Response

P321	Specific treatment (see advice on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312	Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.
P337+P313	If eye irritation persists: Get medical advice/attention.

Precautionary statement(s): Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
67852-79-3	10-30	2,3,4,5-tetrafluorobenzoic acid, sodium
7732-18-5	>60	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available).

Continued...

	▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used. ▸ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Expansion or decomposition on heating may lead to violent rupture of containers. ▸ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	Minor hazard. ▸ Clear area of personnel. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment as required.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke.
Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Continued...

Suitable container	▸ Polyethylene or polypropylene container. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Tracerco T-194a	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hand protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ Eyewash unit.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Tracerco T-194a

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter;

Continued...

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	-AUS P2	-	-PAPR-AUS / Class 1 P2
up to 50 x ES	-	-AUS / Class 1 P2	-
up to 100 x ES	-	-2 P2	-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	80
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Continued...

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion may result in nausea, abdominal irritation, pain and vomiting
Skin Contact	Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Tracerco T-194a	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
2,3,4,5-tetrafluorobenzoic acid, sodium	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
water	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Tracerco T-194a	Not available.
2,3,4,5-TETRAFLUOROBENZOIC ACID, SODIUM	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	⊘	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	✔	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Continued...

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility
Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

2,3,4,5-tetrafluorobenzoic acid, sodium(67852-79-3) is found on the following regulatory lists	
water(7732-18-5) is found on the following regulatory lists	"WHO Model List of Essential Medicines - Adults","Australia Inventory of Chemical Substances (AICS)","OECD List of High Production Volume (HPV) Chemicals","OSPAR National List of Candidates for Substitution – Norway","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","Australia High Volume Industrial Chemical List (HVICL)","International Fragrance Association (IFRA) Survey: Transparency List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

Continued...

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 300

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

The product has been classified according to the legislation in force.

Classification: | Xi; R36/37/38 |

The full text for all R-phrases is displayed in Section 16.

Potential health effects

Inhalation: Irritating to respiratory system.

Eye contact: Irritating to eyes. Eye may become red, tear, and become painful.

Skin contact: Irritating to skin. May cause pain, redness and itching.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not

exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
300			>= 99%	Xi;R36/37/38	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

The full text for all R-phrases is displayed in Section 16.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water for at least 15 minutes. Get medical assistance.

Skin contact: Wash contact areas with soap and water. Get medical attention promptly if symptoms occur after washing.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by

permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Wear approved safety glasses or goggles.

Hand protection: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: Wear suitable protective clothing.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Colourless
Odour: Odourless
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: 45°C (113°F)
Relative density: 1.6
Vapour pressure: No data available.
Vapour density (air=1): No data available.

Evaporation rate: No data available.
Solubility in water: Not miscible
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.
Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Strong oxidising agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: Irritating to respiratory system.

Eye contact: Irritating to eyes. Eye may become red, tear, and become painful.

Skin contact: Irritating to skin. May cause pain, redness and itching.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: The product is insoluble in water.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 08*

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

Irritant.

R36/37/38; Irritating to eyes, respiratory system and skin.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: R36; Irritating to eyes. R37; Irritating to respiratory system. R38; Irritating to skin.

Inventory status: All substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1015390
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 300a

Supplier:
Tracerco
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TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

Not classified as dangerous according to directive 1999/45/EC. The toxicological properties of this compound have not been fully investigated.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
300a			>= 99%	-	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in closed original container in a dry place. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Colourless
Odour: No data available.
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: 48°C (118°F)
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.
Evaporation rate: No data available.
Solubility in water: Insoluble
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.
Autoignition temperature: No data available.

Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Oxidizing agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 09

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

The product has not been classified as dangerous according to the legislation in force.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: None

Inventory status: All substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1014904
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 350

Supplier:
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UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

Not classified as dangerous according to directive 1999/45/EC. The toxicological properties of this compound have not been fully investigated.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
350			>= 99%	-	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Rinse mouth thoroughly. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in closed original container in a dry place. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Colourless
Odour: No data available.
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: 76°C (169°F)
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.
Evaporation rate: No data available.
Solubility in water: No data available.
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.

Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Oxidizing agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 09

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

The product has not been classified as dangerous according to the legislation in force.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: None

Inventory status: All substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1014908
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 400b

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

The product has been classified according to the legislation in force.

Classification: | Xi; R36/37/38 |

The full text for all R-phrases is displayed in Section 16.

Potential health effects

Inhalation: Irritating to respiratory system.

Eye contact: Irritating to eyes. Eye may become red, tear, and become painful.

Skin contact: Irritating to skin. May cause pain, redness and itching.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not

exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
400b			>= 99%	Xi;R36/37/38	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

The full text for all R-phrases is displayed in Section 16.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water for at least 15 minutes. Get medical assistance.

Skin contact: Wash contact areas with soap and water. Get medical attention promptly if symptoms occur after washing.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by

permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Wear approved safety glasses or goggles.

Hand protection: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: Wear suitable protective clothing.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Pale yellow
Odour: No data available.
Odour threshold: No data available.
pH: Not applicable
Melting point: -55°C (-67°F)
Freezing point: No data available.
Boiling Point: 101°C (214°F)
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.

Evaporation rate: No data available.
Solubility in water: Not miscible
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.
Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Strong oxidising agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: Irritating to respiratory system.

Eye contact: Irritating to eyes. Eye may become red, tear, and become painful.

Skin contact: Irritating to skin. May cause pain, redness and itching.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: The product is insoluble in water.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 08*

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

Irritant.

R36/37/38; Irritating to eyes, respiratory system and skin.

S23; Do not breathe vapor or spray. S24/25; Avoid contact with skin and eyes. S26; In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S60; This material and its container must be disposed of as hazardous waste.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: R36; Irritating to eyes. R37; Irritating to respiratory system. R38; Irritating to skin.

Inventory status: All substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date: 21-Aug-2008
SDS No.: 1014943
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 400c

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

The product has been classified according to the legislation in force.

Classification: | Xi; R36/37/38 |

The full text for all R-phrases is displayed in Section 16.

Potential health effects

Inhalation: Irritating to respiratory system.

Eye contact: Irritating to eyes. Eye may become red, tear, and become painful.

Skin contact: Irritating to skin. May cause pain, redness and itching.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not

exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
400c			>= 99%	Xi;R36/37/38	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

The full text for all R-phrases is displayed in Section 16.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water for at least 15 minutes. Get medical assistance.

Skin contact: Wash contact areas with soap and water. Get medical attention promptly if symptoms occur after washing.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by

permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Wear approved safety glasses or goggles.

Hand protection: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: Wear suitable protective clothing.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: No data available.
Odour: No data available.
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: No data available.
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.

Evaporation rate: No data available.
Solubility in water: Not miscible
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.
Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Strong oxidising agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: Irritating to respiratory system.

Eye contact: Irritating to eyes. Eye may become red, tear, and become painful.

Skin contact: Irritating to skin. May cause pain, redness and itching.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: The product is insoluble in water.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 08*

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

Irritant.

R36/37/38; Irritating to eyes, respiratory system and skin.

S23; Do not breathe vapor or spray. S24/25; Avoid contact with skin and eyes. S26; In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S60; This material and its container must be disposed of as hazardous waste.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: R36; Irritating to eyes. R37; Irritating to respiratory system. R38; Irritating to skin.

Inventory status: Not all substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1014960
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 412

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

Not classified as dangerous according to directive 1999/45/EC. The toxicological properties of this compound have not been fully investigated.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
412			>= 99%	-	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in closed original container in a dry place. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Colourless
Odour: Odourless
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: 121°C (250°F)
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.
Evaporation rate: No data available.
Solubility in water: Not miscible
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.

Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Oxidizing agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 09

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

The product has not been classified as dangerous according to the legislation in force.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: None

Inventory status: Not all substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1015406
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 438

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

Not classified as dangerous according to directive 1999/45/EC. The toxicological properties of this compound have not been fully investigated.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
438			>= 99%	-	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in closed original container in a dry place. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: No data available.
Odour: No data available.
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: No data available.
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.
Evaporation rate: No data available.
Solubility in water: Not miscible
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.
Autoignition temperature: No data available.

Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Oxidizing agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 09

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

The product has not been classified as dangerous according to the legislation in force.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: None

Inventory status: Not all substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1015436
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 450a

Supplier:
Tracerco
PO Box 1
Hall Technology Park
Cleveland
1LB
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Belasis
Billingham
TS23
UK

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

Not classified as dangerous according to directive 1999/45/EC. The toxicological properties of this compound have not been fully investigated.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes

450a			>= 99%	-	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Rinse mouth thoroughly. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in closed original container in a dry place. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: No data available.
Odour: No data available.
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: No data available.
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.
Evaporation rate: No data available.
Solubility in water: Insoluble
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: No data available.
Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Oxidising materials.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes

Unused product: 16 05 09

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

The product has not been classified as dangerous according to the legislation in force.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: None

Inventory status: Not all substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1014967
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SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 450b

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

Not classified as dangerous according to directive 1999/45/EC. The toxicological properties of this compound have not been fully investigated.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
450b			>= 99%	-	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in closed original container in a dry place. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Colourless
Odour: Odourless
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: 130°C (266°F)
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.
Evaporation rate: No data available.
Solubility in water: Not miscible
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: 2 mPa.s (Approximate)
Flash point: No data available.

Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Potassium Sodium. Lithium. Calcium. Barium.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 09

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

The product has not been classified as dangerous according to the legislation in force.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: None

Inventory status: Not all substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1015419
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SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 450c

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

Not classified as dangerous according to directive 1999/45/EC. The toxicological properties of this compound have not been fully investigated.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: This product is not flammable.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
450c			>= 99%	-	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Rinse mouth thoroughly. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Avoid inhalation of vapours and spray mist and contact with skin and eyes. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Store in closed original container in a dry place. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Colourless
Odour: Odourless
Odour threshold: No data available.
pH: Not applicable
Melting point: No data available.
Freezing point: No data available.
Boiling Point: 127°C (261°F)
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): No data available.
Evaporation rate: No data available.
Solubility in water: Not miscible
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: 2.28 mPa.s
Flash point: No data available.

Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Potassium Sodium. Lithium. Calcium. Barium.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 09

14 TRANSPORT INFORMATION

ADR/RID Not regulated.

IMDG Not regulated.

IATA Not regulated.

15 REGULATORY INFORMATION

The product has not been classified as dangerous according to the legislation in force.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: None

Inventory status: All substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1015373
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

SAFETY DATA SHEET

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: 462a

Supplier:
Tracerco
PO Box 1
Belasis Hall Technology Park
Billingham
Cleveland
TS23 1LB
UK
Tel: +44 (0)1642 375500 Fax: +44 (0)1642 370704
www.tracerco.com

Emergency telephone:
+44 (0)1642 375500

Intended use: Diagnostic services

Contact person:
Peter.Scaife@matthey.com

2 HAZARDS IDENTIFICATION

The product has been classified according to the legislation in force.

Classification: | R10 |

The full text for all R-phrases is displayed in Section 16.

Potential health effects

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Other health effects: The toxicological properties of this compound have not been fully investigated.

Potential physical / chemical effects: The product is flammable, and heating may generate vapours which may form explosive vapour/air mixtures.

Environment: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	EC No.	CAS-No.	Concentration *	Classification	Notes
462a			>= 99%	R10	-

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4 FIRST-AID MEASURES

General: Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital.

Inhalation: Move injured person into fresh air and keep person calm under observation. Get medical attention if any discomfort continues.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance.

Skin contact: Wash contact areas with soap and water.

Ingestion: Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Inappropriate extinguishing media: Not applicable.

Special fire fighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Unusual fire & explosion hazards: During fire, gases hazardous to health may be formed.

Hazardous combustion products: Carbon oxides, Hydrogen fluoride

Protective measures: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions: Do not smoke, use open fire or other sources of ignition. Avoid inhalation of vapours and spray mist and contact with skin and eyes. Provide adequate ventilation. Wear suitable protective clothing. See Section 8 for personal protective equipment.

Spill cleanup methods: Remove sources of ignition. Beware of the explosion danger. Absorb in vermiculite, dry sand or earth and place into containers. For waste disposal, see section 13.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

Notification procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

7 HANDLING AND STORAGE

Handling: Local exhaust is recommended. Avoid inhalation of vapours and spray mist and contact with skin and eyes. Do not smoke and do not spray near a naked flame or other sources of ignition. The product is flammable, and heating may generate vapours which may form explosive vapour/air mixtures. Wear appropriate personal protective equipment. See Section 8 for personal protective equipment.

Storage: Follow rules for flammable liquids. Keep away from heat, sparks and open flame. Store in a cool and well-ventilated place. Keep containers tightly closed. Store away from incompatible materials.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values: No exposure limits noted for ingredient(s).

Engineering controls: Use explosion-proof ventilation equipment. Provide adequate ventilation and minimize the risk of inhalation of vapors and mists.

Respiratory protection: In case of inadequate ventilation use suitable respirator. Use respiratory equipment with combination filter, type A2/P2. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Eye protection: Risk of contact: Wear approved safety glasses or goggles.

Hand protection: Risk of contact: Wear protective gloves. Neoprene, nitrile, polyethylene or PVC. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin protection: If prolonged or repeated contact is likely, chemical resistant clothing is recommended.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9 PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Colour: Colourless
Odour: No data available.
Odour threshold: No data available.
pH: Not applicable
Melting point: -10°C (14°F)
Freezing point: No data available.

Boiling Point: 142°C (288°F)
Relative density: No data available.
Vapour pressure: No data available.
Vapour density (air=1): 17.5
Evaporation rate: No data available.
Solubility in water: No data available.
Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Viscosity: Not applicable
Flash point: 48°C (118°F)
Autoignition temperature: No data available.
Flammability limit - lower(%): No data available.
Flammability limit - upper (%): No data available.

10 STABILITY AND REACTIVITY

Stability: This product is stable under expected conditions of use.

Conditions to avoid: Heat, sparks, flames.

Incompatible materials: Oxidizing agents.

Hazardous decomposition products:

At elevated temperatures:	Carbon oxides, Hydrogen fluoride

Possibility of hazardous reactions: Will not occur.

11 TOXICOLOGICAL INFORMATION

Inhalation: In high concentrations, vapours may be irritating to the respiratory system.

Eye contact: May cause minor irritation on eye contact.

Skin contact: Mildly irritating to skin with prolonged exposure.

Ingestion: May cause discomfort if swallowed.

Sensitisation: None known.

Listed carcinogens: None

Mutagenesis: No data available.

Reproductive toxicity: No data available.

Other effects: The toxicological properties of this compound have not been fully investigated.

12 ECOLOGICAL INFORMATION

Ecotoxicity: The product components are not classified as environmentally hazardous. However, this does not

exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulation potential: No data available.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Dispose of waste and residues in accordance with local authority requirements.

European waste codes
Unused product: 16 05 08*

14 TRANSPORT INFORMATION

ADR/RID
UN No.: UN1993
Proper shipping name: Flammable liquid, n.o.s. (Perfluorodecalin)
Class: 3
Packing group: III
Label(s): 3

IMDG
UN No.: UN1993
Proper shipping name: Flammable liquid, n.o.s. (Perfluorodecalin)
Class: 3
Packing group: III
EmS No.: F-E, S-E

IATA
UN No.: UN1993
Proper shipping name: Flammable liquid, n.o.s. (Perfluorodecalin)
Class: 3
Packing group: III
Label(s): 3

15 REGULATORY INFORMATION

R10; Flammable.

S23; Do not breathe vapor or spray. S24/25; Avoid contact with skin and eyes.

16 OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3: R10; Flammable.

Inventory status: All substances are listed on EINECS.

Issue date: 21-Aug-2008
Supercedes date:
SDS No.: 1014900
Disclaimer: This MSDS has been prepared using information from sources considered technically reliable. It should not be relied upon as a product specification. The company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other chemical substances. Every user of the product is responsible for evaluating its own processes and conditions of use and selecting appropriate protective measures for employee exposure.

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Rev. 4/20/09

MATERIAL SAFETY DATA SHEET

IDENTIFICATION

PRODUCT NAME	**IRIDIUM ZERO WASH® BEAD TRACER**
RADIONUCLIDE	**IRIDIUM-192 (IR-192)**
CHEMICAL FORM	**IRIDIUM OXIDE**
PHYSICAL FORM	**SOLID**

TOXICITY HAZARDS

IRIDIUM 192 Bead Tracer has short term toxicity hazards if ingested. Data on lethal concentrations and doses are not presently available.

HEALTH HAZARD DATA

ACUTE EFFECTS

May cause Eye and Mucous membrane irritation.
ZERO WASH particle is too large to inhale. Ingestion is the only method of internal consumption.

PREGNANT WOMEN SHOULD NOT BE ALLOWED TO WORK WITH RADIOACTIVE MATERIAL OR BE IN THE EXPOSURE AREA.

FIRST AID

IF SWALLOWED, OBTAIN COMPETENT MEDICAL ATTENTION IMMEDIATELY. The physician should be qualified in Nuclear Medicine and/or Health Physics.

In case of skin contact, wash area with water and a detergent. SURVEY skin area with a Geiger-Mueller instrument and end-window G-M probe to determine cleaning effectiveness. Survey all personnel who may have come in contact with ZERO WASH Bead Tracer. Locate the ZERO WASH bead using GM survey instrument. Use adhesive tape to remove bead from clothing. Treat tape containing bead as RAD WASTE. If numerous beads are found on clothing, remove and place in a container for later cleaning or disposal. SURVEY THE AREA near the spill and the areas the worker has been transferred to for the presence of radioactive material.

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure that adequate flushing occurs by separating eyelids with fingers. Obtain services of a qualified physician.

PHYSICAL DATA

SPECIFIC GRAVITY	1.25 grams/ml - Low Density ZERO WASH bead
	2.65 grams/ml - ZERO WASH bead

WASHOFF	< 0.005% Washoff
APPEARANCE	black/dark brown (low density ZW) and gray to beige spheres (ZW)
ODOR	no odor
HALF LIFE	74.2 Days

FIRE AND EXPLOSION HAZARD DATA

Fire and Explosion Hazard is Negligible
Autoignition Temperature not Applicable
EXTINGUISHING MEDIA - Carbon Dioxide or Halon (This reduces the spread of radioactive material).

SPECIAL FIRE FIGHTING PROCEDURES
Self Contained Breathing Apparatus and fire protective clothing is sufficient when extinguishing a fire involving this product.

UNUSUAL FIRE AND EXPLOSION HAZARDS
NONE

REACTIVITY DATA

STABILITY - STABLE
CONDITION TO AVOID - NONE
INCOMPATIBILITIES - NONE

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS – IRIDIUM 192 MAY CONTAIN VAPORS OR PARTICULATES

HAZARDOUS POLYMERIZATIONS - NONE

SPILL AND LEAK PROCEDURES

SPILL PROCEDURES
CONTROL THE AREA. Do Not Move Personnel from the area until they have been surveyed using a G-M survey instrument. The personnel may survey themselves and if no radioactive material is indicated they may leave the area. This will help eliminate spread of radioactive material. **WEAR PROTECTIVE CLOTHING, SAFETY EYEWEAR, IMPERVIOUS BOOTS, AND RUBBER GLOVES.** Clean up spill area by scooping up spilled material and transfer to a container. It may be necessary to remove some soil or other items indicating the presence of radioactive material. If clothing indicates the presence of radioactive material, remove the bead with adhesive tape, hold tape containing bead for decay in proper storage area and treat as RAD WASTE. If numerous beads are found on clothing, remove clothing and place in a container for later cleaning or disposal. Contain all spilled material and treat as radioactive waste as per regulatory requirements.

The material presented above is believed to be correct, but does not purport to be all inclusive and shall be used as a guide only. SpectraTek shall not be liable for any damage resulting from the use of this information.

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Rev. 4/20/09

MATERIAL SAFETY DATA SHEET

IDENTIFICATION

PRODUCT NAME	**ANTIMONY ZERO WASH® BEAD TRACER**
RADIONUCLIDE	**ANTIMONY-124 (Sb-124)**
CHEMICAL FORM	**ANTIMONY OXIDE**
PHYSICAL FORM	**SOLID**

TOXICITY HAZARDS

ANTIMONY 124 Bead Tracer has short term toxicity hazards if ingested. Data on lethal concentrations and doses are not presently available.

HEALTH HAZARD DATA

ACUTE EFFECTS

May cause Eye and Mucous membrane irritation.
ZERO WASH particle is too large to inhale. Ingestion is the only method of internal consumption.

PREGNANT WOMEN SHOULD NOT BE ALLOWED TO WORK WITH RADIOACTIVE MATERIAL OR BE IN THE EXPOSURE AREA.

FIRST AID

IF SWALLOWED, OBTAIN COMPETENT MEDICAL ATTENTION IMMEDIATELY. The physician should be qualified in Nuclear Medicine and/or Health Physics.

In case of skin contact, wash area with water and a detergent. SURVEY skin area with a Geiger-Mueller instrument and end-window G-M probe to determine cleaning effectiveness. Survey all personnel who may have come in contact with ZERO WASH Bead Tracer. Locate the ZERO WASH bead using GM survey instrument. Use adhesive tape to remove bead from clothing. Treat tape containing bead as RAD WASTE. If numerous beads are found on clothing, remove and place in a container for later cleaning or disposal. SURVEY THE AREA near the spill and the areas the worker has been transferred to for the presence of radioactive material.

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure that adequate flushing occurs by separating eyelids with fingers. Obtain services of a qualified physician.

PHYSICAL DATA

SPECIFIC GRAVITY	1.25 grams/ml - Low Density ZERO WASH bead
	2.65 grams/ml - ZERO WASH bead

WASHOFF	< 0.1% Washoff
APPEARANCE	black/dark brown (low density ZW) and gray to beige spheres (ZW)
ODOR	no odor
HALF LIFE	60.4 Days

FIRE AND EXPLOSION HAZARD DATA

Fire and Explosion Hazard is Negligible
Autoignition Temperature not Applicable
EXTINGUISHING MEDIA - Carbon Dioxide or Halon (This reduces the spread of radioactive material).

SPECIAL FIRE FIGHTING PROCEDURES
Self Contained Breathing Apparatus and fire protective clothing is sufficient when extinguishing a fire involving this product.

UNUSUAL FIRE AND EXPLOSION HAZARDS
NONE

REACTIVITY DATA

STABILITY - STABLE
CONDITION TO AVOID - NONE
INCOMPATIBILITIES - NONE

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS – IRIDIUM 192 MAY CONTAIN VAPORS OR PARTICULATES

HAZARDOUS POLYMERIZATIONS - NONE

SPILL AND LEAK PROCEDURES

SPILL PROCEDURES
CONTROL THE AREA. Do Not Move Personnel from the area until they have been surveyed using a G-M survey instrument. The personnel may survey themselves and if no radioactive material is indicated they may leave the area. This will help eliminate spread of radioactive material. **WEAR PROTECTIVE CLOTHING, SAFETY EYEWEAR, IMPERVIOUS BOOTS, AND RUBBER GLOVES.** Clean up spill area by scooping up spilled material and transfer to a container. It may be necessary to remove some soil or other items indicating the presence of radioactive material. If clothing indicates the presence of radioactive material, remove the bead with adhesive tape, hold tape containing bead for decay in proper storage area and treat as RAD WASTE. If numerous beads are found on clothing, remove clothing and place in a container for later cleaning or disposal. Contain all spilled material and treat as radioactive waste as per regulatory requirements.

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Rev. 4/20/09

MATERIAL SAFETY DATA SHEET

IDENTIFICATION

PRODUCT NAME	**SCANDIUM ZERO WASH® BEAD TRACER**
RADIONUCLIDE	**SCANDIUM-46 (Sc-46)**
CHEMICAL FORM	**SCANDIUM OXIDE**
PHYSICAL FORM	**SOLID**

TOXICITY HAZARDS

SCANDIUM 46 Bead Tracer has short term toxicity hazards if ingested. Data on lethal concentrations and doses are not presently available.

HEALTH HAZARD DATA

ACUTE EFFECTS

May cause Eye and Mucous membrane irritation.
ZERO WASH particle is too large to inhale. Ingestion is the only method of internal consumption.

PREGNANT WOMEN SHOULD NOT BE ALLOWED TO WORK WITH RADIOACTIVE MATERIAL OR BE IN THE EXPOSURE AREA.

FIRST AID

IF SWALLOWED, OBTAIN COMPETENT MEDICAL ATTENTION IMMEDIATELY. The physician should be qualified in Nuclear Medicine and/or Health Physics.

In case of skin contact, wash area with water and a detergent. SURVEY skin area with a Geiger-Mueller instrument and end-window G-M probe to determine cleaning effectiveness. Survey all personnel who may have come in contact with ZERO WASH Bead Tracer. Locate the ZERO WASH bead using GM survey instrument. Use adhesive tape to remove bead from clothing. Treat tape containing bead as RAD WASTE. If numerous beads are found on clothing, remove and place in a container for later cleaning or disposal. SURVEY THE AREA near the spill and the areas the worker has been transferred to for the presence of radioactive material.

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure that adequate flushing occurs by separating eyelids with fingers. Obtain services of a qualified physician.

PHYSICAL DATA

SPECIFIC GRAVITY	1.25 grams/ml - Low Density ZERO WASH bead
	2.65 grams/ml - ZERO WASH bead
WASHOFF	< 0.005% Washoff
APPEARANCE	black/dark brown (low density ZW) and gray to beige spheres (ZW)
ODOR	no odor
HALF LIFE	84 Days

FIRE AND EXPLOSION HAZARD DATA

Fire and Explosion Hazard is Negligible
Autoignition Temperature not Applicable
EXTINGUISHING MEDIA - Carbon Dioxide or Halon (This reduces the spread of radioactive material).

SPECIAL FIRE FIGHTING PROCEDURES
Self Contained Breathing Apparatus and fire protective clothing is sufficient when extinguishing a fire involving this product.

UNUSUAL FIRE AND EXPLOSION HAZARDS
NONE

REACTIVITY DATA

STABILITY - STABLE
CONDITION TO AVOID - NONE
INCOMPATIBILITIES - NONE

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS – IRIDIUM 192 MAY CONTAIN VAPORS OR PARTICULATES

HAZARDOUS POLYMERIZATIONS - NONE

SPILL AND LEAK PROCEDURES

SPILL PROCEDURES
CONTROL THE AREA. Do Not Move Personnel from the area until they have been surveyed using a G-M survey instrument. The personnel may survey themselves and if no radioactive material is indicated they may leave the area. This will help eliminate spread of radioactive material. **WEAR PROTECTIVE CLOTHING, SAFETY EYEWEAR, IMPERVIOUS BOOTS, AND RUBBER GLOVES.** Clean up spill area by scooping up spilled material and transfer to a container. It may be necessary to remove some soil or other items indicating the presence of radioactive material. If clothing indicates the presence of radioactive material, remove the bead with adhesive tape, hold tape containing bead for decay in proper storage area and treat as RAD WASTE. If numerous beads are found on clothing, remove clothing and place in a container for later cleaning or disposal. Contain all spilled material and treat as radioactive waste as per regulatory requirements.

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SDS no. D176
Version 10
Revision date 17-Jul-2018
Supersedes Date: 31-Jul-2015

Safety Data Sheet
High Temperature Expanding Additive D176

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name High Temperature Expanding Additive D176
Product code D176

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Magnesium oxide

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Magnesium oxide	215-171-9	1309-48-4	60-100
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Do not breathe dust. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid dust formation Avoid contact with: Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Component Information

Chemical Name	Arabic	Australia	Egypt
Magnesium oxide	10 mg/m³ TWA	10mg/m³TWAfume	10 mg/m³ TWA
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Magnesium oxide	Not determined	10 mg/m³ TWA	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Magnesium oxide	Not determined	Not determined	10 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Magnesium oxide	10 mg/m³ TWA	15 mg/m³ TWA	4 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Magnesium oxide	Not determined	5 mg/m³ TWA 10 mg/m³ STEL	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Neoprene Nitrile Butyl Rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	Light yellow Brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	10.5	@ 10% (H2O)
Melting / freezing point	>2093 °C/ 3799 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	

Specific gravity	3.19 g/cm³
Bulk density	No information available
Relative density	No information available
Water solubility	Insoluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Magnesium oxide	No data available	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates

Magnesium oxide	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Magnesium oxide	Inorganic compound
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Magnesium oxide	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Magnesium oxide	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Magnesium oxide	No information available
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	31-Jul-2015
Revision date	17-Jul-2018
Version	10
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

HALLIBURTON

SAFETY DATA SHEET

BARITE

Revision Date: 08-Jan-2019 **Revision Number:** 53

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BARITE

Other means of Identification

Synonyms None

Hazardous Material Number: HM000105

Recommended use of the chemical and restrictions on use

Recommended Use Weight Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Carcinogenicity	Category 1A - H350
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled
H350i - May cause cancer by inhalation

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P281 - Use personal protective equipment as required

Response
P314 - Get medical attention/advice if you feel unwell
P308 + P313 - IF exposed or concerned: Get medical advice/attention

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Crystalline silica, quartz	14808-60-7

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Crystalline silica, quartz	14808-60-7	1 - 5%	Carc. 1A (H350) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

None anticipated

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a well ventilated area. Keep container closed when not in use. Store locked up. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Crystalline silica, quartz	14808-60-7	TWA: 0.1 mg/m^3	TWA: 0.025 mg/m^3

Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	Pink to tan to gray
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	4.23
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	233.4
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	14808-60-7	> 15000 mg/kg (human)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mechanical irritation to eye.

Skin Contact None known.

Ingestion None known.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Exposure Levels

No data available

Interactive effects

Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation

Crystalline silica, quartz	14808-60-7	Non-irritating to the eye No information available

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	14808-60-7	No information available.

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	14808-60-7	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	14808-60-7	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	14808-60-7	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	14808-60-7	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	14808-60-7	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	14808-60-7	EC50(72 h)=440 mg/L (Pseudokirchneriella subcapitata)	LL0(96 h)=10000 mg/L (Danio rerio)	No information available	LL50(24 h)>10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	14808-60-7	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Crystalline silica, quartz	14808-60-7	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	14808-60-7	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging
Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply

Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 08-Jan-2019

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BENTONITE

Revision Date: 28-Jan-2020 **Revision Number:** 51

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BENTONITE

Other means of Identification

Synonyms None

Hazardous Material Number: HM000126

Recommended use of the chemical and restrictions on use

Recommended Use Weight Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Carcinogenicity	Category 2 - H351
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements:
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P281 - Use personal protective equipment as required

Response
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Crystalline silica, quartz	14808-60-7

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Crystalline silica, quartz	14808-60-7	1 - 5%	Carc. 1A (H350) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire
None anticipated

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions
This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information
Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Crystalline silica, quartz	14808-60-7	TWA: 0.1 mg/m^3	TWA: 0.025 mg/m^3

Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	Various
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	9.9
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.65
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Hydrofluoric acid.

10.6. Hazardous decomposition products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	14808-60-7	> 15000 mg/kg (human)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mechanical irritation to eye.

Skin Contact None known.

Ingestion May act as obstruction if swallowed.

Chronic Effects/Carcinogenicity This product contains a suspected carcinogen. May cause damage to organs through prolonged or repeated exposure. Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Exposure Levels

No data available

Interactive effects

Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the eye No information available

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	14808-60-7	No information available.

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	14808-60-7	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	14808-60-7	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	14808-60-7	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	14808-60-7	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	14808-60-7	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	14808-60-7	EC50(72 h)=440 mg/L (Pseudokirchneriella subcapitata)	LL0(96 h)=10000 mg/L (Danio rerio)	No information available	LL50(24 h)>10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	14808-60-7	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Crystalline silica, quartz	14808-60-7	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	14808-60-7	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable

of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 28-Jan-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H351 - Suspected of causing cancer if inhaled
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CALCIUM CARBONATE

Revision Date: 29-Oct-2018 **Revision Number:** 38

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CALCIUM CARBONATE

Other means of Identification

Synonyms None

Hazardous Material Number: HM000141

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Carcinogenicity	Category 1A - H350
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H350i - May cause cancer by inhalation
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P281 - Use personal protective equipment as required

Response
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Crystalline silica, quartz	14808-60-7

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Crystalline silica, quartz	14808-60-7	1 - 5%	Carc. 1A (H350) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Crystalline silica, quartz	14808-60-7	TWA: 0.1 mg/m^3	TWA: 0.025 mg/m^3

Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	Light tan
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.7
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong acids. Prolonged contact with aluminum. Ammonium salts.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite

(1470 C).

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	14808-60-7	> 15000 mg/kg (human)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mechanical irritation to eye.

Skin Contact None known.

Ingestion None known.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Exposure Levels

No data available

Interactive effects

Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be

exposed to quartz dust.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the eye No information available

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	14808-60-7	No information available.

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	14808-60-7	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	14808-60-7	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	14808-60-7	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	14808-60-7	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	14808-60-7	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	14808-60-7	EC50(72 h)=440 mg/L (Pseudokirchneriella subcapitata)	LL0(96 h)=10000 mg/L (Danio rerio)	No information available	LL50(24 h)>10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	14808-60-7	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Crystalline silica, quartz	14808-60-7	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	14808-60-7	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 29-Oct-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
OSHA
ECHA C&L

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from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

GASCON 469

Revision Date: 30-Apr-2020 **Revision Number:** 33

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name GASCON 469

Other means of Identification

Synonyms None

Hazardous Material Number: HM000753

Recommended use of the chemical and restrictions on use

Recommended Use Cement Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool well ventilated area. Keep from excessive heat. Keep from freezing. Keep container closed when not in use. Store in non-rusting containers. Product has a shelf life of 12 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection None known.
Skin Protection Normal work coveralls.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid
Color Transparent
Odor: Odorless
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	10
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.1
Water Solubility	Soluble in water (10g/100ml)
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) 80

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous	NA	No data available	No data available	No data available

substances in concentrations above cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact May cause mechanical irritation to eye.
Skin Contact May cause mild skin irritation.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components are listed on the AICS or are subject to a relevant exemption, permit, or

	assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

GASSTOP ADDITIVE

Revision Date: 23-Jul-2018 **Revision Number:** 32

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name GASSTOP ADDITIVE

Other means of Identification

Synonyms None

Hazardous Material Number: HM000755

Recommended use of the chemical and restrictions on use

Recommended Use Cement Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified	
Combustible dust	Combustible dust

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection Wear protective clothing appropriate for the work environment.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White to off white
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	-8 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.37
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	> 600
VOC Content (%)	< 5%

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
Oxides of nitrogen. Oxides of sulfur. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact Not irritating to skin in rabbits.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List	All components listed on inventory or are exempt.

(DSL)

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 23-Jul-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HALAD® 344 CEMENT ADDITIVE

Revision Date: 01-Feb-2021 **Revision Number:** 45

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HALAD® 344 CEMENT ADDITIVE

Other means of Identification

Synonyms None

Hazardous Material Number: HM000816

Recommended use of the chemical and restrictions on use

Recommended Use Fluid Loss Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	NF	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool, dry location. Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)

Hand Protection None known.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Powder
Color White to off white
Odor: Odorless
Odor Threshold: No information available

Property	Values	Remarks/ - Method
pH:	No data available	
Freezing Point / Range	-8 °C	
Melting Point / Range	No data available	
Pour Point / Range	No data available	
Boiling Point / Range	No data available	
Flash Point	No data available	
Evaporation rate	No data available	
Vapor Pressure	No data available	
Vapor Density	No data available	
Specific Gravity	1.22	
Water Solubility	Soluble in water	
Solubility in other solvents	No data available	
Partition coefficient: n-octanol/water	No data available	
Autoignition Temperature	No data available	
Decomposition Temperature	No data available	
Viscosity	No data available	
Explosive Properties	No information available	
Oxidizing Properties	No information available	

9.2. Other information

Molecular Weight	> 600
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
Oxides of nitrogen. Carbon monoxide and carbon dioxide. Oxides of sulfur.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation None known.

Eye Contact May cause mechanical irritation to eye.

Skin Contact Not irritating to skin in rabbits.

Ingestion No adverse health effects are expected from swallowing.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Not readily biodegradable

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in	NA	No information available

concentrations above cut-off values according to the competent authority		

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 01-Feb-2021

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury

w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HALAD® 413L CEMENT ADDITIVE

Revision Date: 07-May-2018 **Revision Number:** 26

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HALAD® 413L CEMENT ADDITIVE

Other means of Identification

Synonyms None

Hazardous Material Number: HM000824

Recommended use of the chemical and restrictions on use

Recommended Use Fluid Loss Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician	Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid
Color Brown-black
Odor: Sweet
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	7.5
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.1
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Oxides of nitrogen. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact None known.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	Product contains one or more components not listed on the inventory.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 07-May-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HR-25L

Revision Date: 01-Feb-2021 **Revision Number:** 41

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HR-25L

Other means of Identification

Synonyms None

Hazardous Material Number: HM000893

Recommended use of the chemical and restrictions on use

Recommended Use Cement Retarder

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 3 - H402

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H318 - Causes serious eye damage
H402 - Harmful to aquatic life

Precautionary Statements

Prevention
P273 - Avoid release to the environment
P280 - Wear eye protection/face protection

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Storage None

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Tartaric acid	87-69-4

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Tartaric acid	87-69-4	30 - 60%	Eye Corr. 1 (H318) Aquatic Acute 3 (H402)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes severe eye irritation which may damage tissue.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information
Store away from alkalis. Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Tartaric acid	87-69-4	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an

	industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Impervious rubber gloves.
Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Light yellow-green
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	1.7
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	103 °C / 219 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.2
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers. Strong alkalis.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tartaric acid	87-69-4	2000 - 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Not irritating to skin in rabbits.

Ingestion Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Tartaric acid	87-69-4	Non-irritating to the skin (Rabbit) (in vitro)

Substances	CAS Number	Serious eye damage/irritation
Tartaric acid	87-69-4	Causes severe eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Tartaric acid	87-69-4	Did not cause sensitization on laboratory animals (mouse)

Substances	CAS Number	Respiratory Sensitization
Tartaric acid	87-69-4	No information available

Substances	CAS Number	Mutagenic Effects
Tartaric acid	87-69-4	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Tartaric acid	87-69-4	Did not show carcinogenic effects in animal experiments (Rat) (similar substances)

Substances	CAS Number	Reproductive toxicity
Tartaric acid	87-69-4	Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Tartaric acid	87-69-4	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Tartaric acid	87-69-4	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Tartaric acid	87-69-4	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Tartaric acid	87-69-4	E(B)C50 2575.2 mg/L (Skeletonema costatum) E(R)C50 1198 mg/L (Skeletonema costatum) EC50 791.25 mg/L (Skeletonema costatum) EC50 (72h) 51.4043 mg/L (Pseudokirchnerella subcapitata)	LC50 250 mg/L (Scophthalmus maximus) LC50 (96h) > 100 mg/L (Danio rerio)	EC50 (3h) > 1000 mg/L (Activated sludge)	TLM96 330-1000 ppm (Crangon crangon) EC50 46.04 - 165.37 mg/L (Ceriodaphnia dubia) LC50 3753.85 (Acartia tonsa) EC50 (48h) 93.313 mg/L (Daphnia magna)

12.2. Persistence and degradability

Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Tartaric acid	87-69-4	Readily biodegradable (85% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Tartaric acid	87-69-4	-1

12.4. Mobility in soil

Substances	CAS Number	Mobility
Tartaric acid	87-69-4	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 01-Feb-2021

Revision Note
SDS sections updated:
15

Full text of H-Statements referred to under sections 2 and 3
H318 - Causes serious eye damage
H402 - Harmful to aquatic life

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HR-6L

Revision Date: 10-Mar-2020 **Revision Number:** 23

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HR-6L

Other means of Identification

Synonyms None

Hazardous Material Number: HM000901

Recommended use of the chemical and restrictions on use

Recommended Use Cement Retarder

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Keep container closed when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally necessary.

Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties
Physical State: Liquid
Color Dark brown
Odor: Molasses
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	9.5
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 98 °C / > 210 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.21
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Liquid Density	10.08 lbs/gal

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Oxides of sulfur. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

This product is not regarded as hazardous waste. Dispose in accordance with local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 10-Mar-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

KWIK SEAL ADDITIVE

Revision Date: 30-Apr-2020 **Revision Number:** 23

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name KWIK SEAL ADDITIVE

Other means of Identification

Synonyms None

Hazardous Material Number: HM000976

Recommended use of the chemical and restrictions on use

Recommended Use Lost Circulation Material

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

None known.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid creating or inhaling dust. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Color Brown
Odor: Woody
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.3
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above	NA	No data available	No data available	No data available

cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.

US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SA-541

Revision Date: 16-Mar-2020 **Revision Number:** 26

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SA-541

Other means of Identification

Synonyms None

Hazardous Material Number: HM001226

Recommended use of the chemical and restrictions on use

Recommended Use Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Flush skin with large amounts of water. If irritation persists, get medical attention.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Slippery when wet. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Slippery when wet. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection Wear protective clothing appropriate for the work environment.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Color White to light straw
Odor: Mild
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	10.1
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 93 °C / > 200 °F
Lower flammability limit	0.29 oz./ft3
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.4
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	510 °C / 950 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Bulk Density	36 lbs/gallon

10. Stability and Reactivity

10.1. Reactivity
May form combustible dust concentrations in air.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous	NA	No data available	No data available	No data available

substances in concentrations above cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components are listed on the AICS or are subject to a relevant exemption, permit, or

	assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 16-Mar-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SCR-100L

Revision Date: 28-Jan-2020 **Revision Number:** 43

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SCR-100L

Other means of Identification

Synonyms None

Hazardous Material Number: HM001254

Recommended use of the chemical and restrictions on use

Recommended Use Retarder

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a dry location. Keep container closed when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Blue
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	3 - 4 (28%)
Freezing Point / Range	-4 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 93 °C / > 200 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.16
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	520 °C
Decomposition Temperature	No data available
Viscosity	15-30 cP @ 25°C
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	~60%
Liquid Density	9.66

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Oxides of nitrogen. Oxides of sulfur. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according	NA	No data available	No data available	No data available

to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill or burn in an approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 28-Jan-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SILICALITE LIQUID

Revision Date: 30-Apr-2020 **Revision Number:** 26

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SILICALITE LIQUID

Other means of Identification

Synonyms None

Hazardous Material Number: HM001274

Recommended use of the chemical and restrictions on use

Recommended Use Light Weight Cement Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Flush skin with large amounts of water. If irritation persists, get medical attention.

Ingestion Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Not applicable

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
None known. Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Keep container closed when not in use. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally necessary.

Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Dark gray
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6- 8
Freezing Point / Range	0 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	100 °C / > 212 °F
Evaporation rate	No data available
Vapor Pressure	22.9
Vapor Density	No data available
Specific Gravity	1.37
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Liquid Density	11.64 lbs/gal

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye and skin contact.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SODIUM CHLORIDE

Revision Date: 30-Apr-2020 **Revision Number:** 38

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SODIUM CHLORIDE

Other means of Identification

Synonyms None

Hazardous Material Number: HM001682

Recommended use of the chemical and restrictions on use

Recommended Use Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Sodium chloride	7647-14-5

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium chloride	7647-14-5	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
Causes mild eye irritation. May be harmful if swallowed.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
None anticipated

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium chloride	7647-14-5	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls	Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property	Values	Remarks/ - Method
pH:	No data available	

Freezing Point / Range	No data available
Melting Point / Range	801 °C / 1473.8 °F
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.16
Water Solubility	Very soluble
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive. Stable under normal conditions

10.2. Chemical stability

Stable under normal conditions

10.3. Possibility of hazardous reactions

None known

10.4. Conditions to avoid

None known.

10.5. Incompatible materials

None known.

10.6. Hazardous decomposition products

None known.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes mild eye irritation. May be harmful if swallowed.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium chloride	7647-14-5	3000 mg/kg-bw (rat)	>10,000 mg/kg bw (rabbit)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	May cause mild respiratory irritation.
Eye Contact	Causes mild eye irritation.
Skin Contact	May cause mild skin irritation.
Ingestion	May be harmful if swallowed.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium chloride	7647-14-5	Not a dermal irritant

Substances	CAS Number	Serious eye damage/irritation
Sodium chloride	7647-14-5	Causes mild eye irritation.

Substances	CAS Number	Skin Sensitization
Sodium chloride	7647-14-5	Not confirmed to cause skin or respiratory sensitization.

Substances	CAS Number	Respiratory Sensitization
Sodium chloride	7647-14-5	Not confirmed to cause skin or respiratory sensitization.

Substances	CAS Number	Mutagenic Effects
Sodium chloride	7647-14-5	No information available

Substances	CAS Number	Carcinogenic Effects
Sodium chloride	7647-14-5	Based on available data, the classification criteria are not met.

Substances	CAS Number	Reproductive toxicity
Sodium chloride	7647-14-5	Based on available data, the classification criteria are not met.

Substances	CAS Number	STOT - single exposure
Sodium chloride	7647-14-5	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Sodium chloride	7647-14-5	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Sodium chloride	7647-14-5	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium chloride	7647-14-5	No information available	LC50 (96h) 9675 mg/L	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium chloride	7647-14-5	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Sodium chloride	7647-14-5	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium chloride	7647-14-5	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.

US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
CLP – REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Classification, Labelling and Packaging of substances and mixtures
EC – European Commission
EC10 – Effective Concentration 10%
EC50 – Effective Concentration 50%
EEC – European Economic Community
ErC50 – Effective Concentration growth rate 50%
IBC Code – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL0 – Lethal Loading 0%
LL50 – Lethal Loading 50%
MARPOL – International Convention for the Prevention of Pollution from Ships
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NOEC – No Observed Effect Concentration
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
PC – Chemical Product category
PEL – Permissible Exposure Limit
ppm – parts per million
PROC – Process category
REACH – REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals

STEL – Short Term Exposure Limit
SU – Sector of Use category
TWA – Time-Weighted Average
UN – United Nations
VOC – Volatile Organic Carbon
vPvB – very Persistent and very Bioaccumulative
VLA-ED - time-weighted average values for a whole work shift [Spain valores límite ambientales para la exposición diaria]
NDS - najwyisze dopuszczalne stkienie na stanowisku pracy
SZW - Netherlands Ministry of Social Affairs and Employment
ADR - The European Agreement concerning the International Carriage of Dangerous Goods by Road
AS/NZS 1715 - New Zeland Standard on Selection, use and maintenance of respiratory protective equipment
C - Celsius
EN 149 - European standard on filtering halfmasks to protect against particles
EN 374 - European standard on Protective gloves against chemicals and micro-organisms
FFP - Filtering Facepieces
h - hour
IATA/ICAO - International Air Transport Association / International Civil Aviation Organization
IMDG/IMO - International Maritime Dangerous Goods / International Maritime Organization
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
NDS - OEL-TWA [Poland najwyisze dopuszczalne stkienie na stanowisku pracy]
R/H-phrases - Risk/Hazard-phrases
RID - The European Agreement concerning the International Carriage of Dangerous Goods by Rail
UK - United Kingdom
w/w - weight/weight
VLA-EC - short-time excursion limits [Spain valores límite ambientales para la exposición de corta duración]
MAK - Maximum Workplace Concentration
d - day
vPvB – very Persistent and very Bioaccumulative

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SODA ASH

Revision Date: 24-Apr-2017 **Revision Number:** 42

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SODA ASH

Other means of Identification

Synonyms None

Hazardous Material Number: HM001822

Recommended use of the chemical and restrictions on use

Recommended Use Buffer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H319 - Causes serious eye irritation

Precautionary Statements

Prevention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Sodium carbonate	497-19-8

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium carbonate	497-19-8	60 - 100%	Eye Irrit. 2 (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store in a cool, dry location. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium carbonate	497-19-8	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Localized ventilation should be used to control dust levels.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be

performed by an Industrial Hygienist or other qualified professional.

Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Dust proof goggles.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	11.5
Freezing Point / Range	No data available
Melting Point / Range	851 °C
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.5
Water Solubility	Partly soluble
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	105.99 g/mole
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes eye irritation

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	497-19-8	4090 mg/kg (Rat) 2800 mg/kg (Rat)	2210 mg/kg (Mouse) > 2000 mg/kg (Rabbit)	2.3 mg/L (Rat) 2h

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact Causes eye irritation.
Skin Contact Not irritating to skin in rabbits.
Ingestion Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium carbonate	497-19-8	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Sodium carbonate	497-19-8	Irritating to eyes

Substances	CAS Number	Skin Sensitization
Sodium carbonate	497-19-8	Not classified

Substances	CAS Number	Respiratory Sensitization
Sodium carbonate	497-19-8	No information available

Substances	CAS Number	Mutagenic Effects
Sodium carbonate	497-19-8	In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium carbonate	497-19-8	No information available

Substances	CAS Number	Reproductive toxicity
Sodium carbonate	497-19-8	Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Sodium carbonate	497-19-8	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Sodium carbonate	497-19-8	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Sodium carbonate	497-19-8	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium carbonate	497-19-8	EC50 242 mg/L (Nitzschia)	TLM24 385 mg/L (Lepomis macrochirus) LC50 310-1220 mg/L (Pimephales promelas) LC50 (96h) 300 mg/L (Lepomis macrochirus)	No information available	EC50 265 mg/L (Daphnia magna) EC50 (48h) 200 – 227 mg/L (Ceriodaphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium carbonate	497-19-8	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Sodium carbonate	497-19-8	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium carbonate	497-19-8	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable

Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 24-Apr-2017

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter

NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SODIUM BICARBONATE

Revision Date: 30-Apr-2020 **Revision Number:** 38

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SODIUM BICARBONATE

Other means of Identification

Synonyms None

Hazardous Material Number: HM001824

Recommended use of the chemical and restrictions on use

Recommended Use Buffer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Not applicable

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from acids. Store in a dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls	A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.16
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent	NA	No data available	No data available	No data available

authority				

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact May cause mechanical irritation to eye.
Skin Contact Not irritating to skin in rabbits.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CEMENT - CLASS G

Revision Date: 02-Aug-2018 **Revision Number:** 38

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CEMENT - CLASS G

Other means of Identification

Synonyms None

Hazardous Material Number: HM001839

Recommended use of the chemical and restrictions on use

Recommended Use Cement

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Carcinogenicity	Category 1A - H350
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H350 - May cause cancer by inhalation
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P280 - Wear protective gloves/eye protection/face protection
P281 - Use personal protective equipment as required

Response
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER/doctor/physician if you feel unwell
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Portland cement	65997-15-1
Crystalline silica, quartz	14808-60-7

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Portland cement	65997-15-1	60 - 100%	Skin Irrit. 2 (H315)

			Eye Corr. 1 (H318) Skin Sens. 1 (H317) STOT SE 3 (H335)
Crystalline silica, quartz	14808-60-7	1 - 5%	Carc. 1A (H350) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause allergic skin reaction. May cause respiratory irritation. Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

None - does not burn.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep container closed when not in use. Store locked up. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Portland cement	65997-15-1	TWA: 10 mg/m³	TWA: 1 mg/m³
Crystalline silica, quartz	14808-60-7	TWA: 0.1 mg/m³	TWA: 0.025 mg/m³

Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.

Hand Protection Impervious rubber gloves.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Color Gray
Odor: Odorless
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	12.4
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	3.14

Water Solubility	No data available
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Keep away from any contact with water.

10.5. Incompatible materials

Hydrofluoric acid.

10.6. Hazardous decomposition products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause allergic skin reaction. May cause respiratory irritation. Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Portland cement	65997-15-1	> 2000 mg/kg (Rat)	> 2000 mg/kg	> 1 mg/L (Rat) 4h
Crystalline silica, quartz	14808-60-7	> 15000 mg/kg (human)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation Causes moderate respiratory irritation. Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes skin irritation. May cause alkali burns with confined contact. May cause an allergic skin reaction. Can dry skin.

Ingestion Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Exposure Levels
No data available

Interactive effects
Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Portland cement	65997-15-1	Irritating to skin. (Rabbit)
Crystalline silica, quartz	14808-60-7	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Portland cement	65997-15-1	Corrosive to eyes
Crystalline silica, quartz	14808-60-7	Non-irritating to the eye No information available

Substances	CAS Number	Skin Sensitization
Portland cement	65997-15-1	May cause sensitization by skin contact
Crystalline silica, quartz	14808-60-7	No information available.

Substances	CAS Number	Respiratory Sensitization
Portland cement	65997-15-1	No information available
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	Mutagenic Effects
Portland cement	65997-15-1	No data of sufficient quality are available.
Crystalline silica, quartz	14808-60-7	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Portland cement	65997-15-1	No data of sufficient quality are available.
Crystalline silica, quartz	14808-60-7	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure.

Substances	CAS Number	Reproductive toxicity

Portland cement	65997-15-1	No data of sufficient quality are available.
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	STOT - single exposure
Portland cement	65997-15-1	May cause respiratory irritation.
Crystalline silica, quartz	14808-60-7	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Portland cement	65997-15-1	No data of sufficient quality are available.
Crystalline silica, quartz	14808-60-7	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Portland cement	65997-15-1	Not applicable
Crystalline silica, quartz	14808-60-7	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Portland cement	65997-15-1	No information available	No information available	No information available	No information available
Crystalline silica, quartz	14808-60-7	EC50(72 h)=440 mg/L (Pseudokirchneriella subcapitata)	LL0(96 h)=10000 mg/L (Danio rerio)	No information available	LL50(24 h)>10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Portland cement	65997-15-1	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, quartz	14808-60-7	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Portland cement	65997-15-1	No information available
Crystalline silica, quartz	14808-60-7	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Portland cement	65997-15-1	No information available
Crystalline silica, quartz	14808-60-7	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 02-Aug-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

NF-6

Revision Date: 11-Feb-2021 **Revision Number:** 41

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name NF-6

Other means of Identification

Synonyms None

Hazardous Material Number: HM001971

Recommended use of the chemical and restrictions on use

Recommended Use Defoamer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Carbon dioxide, dry chemical, foam.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Use water spray to cool fire exposed surfaces. Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Keep container closed when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Organic vapor respirator with a dust/mist filter. (A2P2/P3)
Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Polyvinylchloride gloves. (>= 8 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in

	practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Yellow
Odor:	Mild	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	182 °C / 360 °F
Flash Point	> 170 °C / > 340 °F
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.93
Water Solubility	Dispersible
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	385 °C / 725 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Liquid Density	7.70 lbs/gal

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Hydrocarbons. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact None known.

Skin Contact None known.

Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Dispose in accordance with local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 11-Feb-2021

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit

PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID
Cosmetic Ingredient Review

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

D-AIR 3000L

Revision Date: 07-Nov-2019 **Revision Number:** 31

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name D-AIR 3000L

Other means of Identification

Synonyms None

Hazardous Material Number: HM003191

Recommended use of the chemical and restrictions on use

Recommended Use Defoamer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Alkenes, C15-C18	93762-80-2

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Alkenes, C15-C18	93762-80-2	60 - 100%	Asp. Tox. 1 (H304) Skin haz. Repeated exp. Yes (AUH066)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration. Rinse mouth. Never give anything by mouth to an unconscious person.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Alkenes, C15-C18	93762-80-2	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally necessary.

Hand Protection None known.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Opaque
Odor:	Hydrocarbon	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	5.5-7.9
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 121 °C / > 249.8 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.92
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alkenes, C15-C18	93762-80-2	> 5000 mg/kg (Rat) (similar substance)	> 2000 mg/kg (Rat) (similar substance)	> 2.1 mg/L (Rat)

Immediate, delayed and chronic health effects from exposure

Inhalation	None known.
Eye Contact	May cause mild eye irritation.
Skin Contact	May cause mild skin irritation.

Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Alkenes, C15-C18	93762-80-2	Not irritating to skin in rabbits. (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Alkenes, C15-C18	93762-80-2	Non-irritating to rabbit's eye (similar substances)

Substances	CAS Number	Skin Sensitization
Alkenes, C15-C18	93762-80-2	Did not cause sensitization on laboratory animals (similar substances)

Substances	CAS Number	Respiratory Sensitization
Alkenes, C15-C18	93762-80-2	No information available

Substances	CAS Number	Mutagenic Effects
Alkenes, C15-C18	93762-80-2	In vitro tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Alkenes, C15-C18	93762-80-2	No information available

Substances	CAS Number	Reproductive toxicity
Alkenes, C15-C18	93762-80-2	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)

Substances	CAS Number	STOT - single exposure
Alkenes, C15-C18	93762-80-2	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Alkenes, C15-C18	93762-80-2	No information available

Substances	CAS Number	Aspiration hazard
Alkenes, C15-C18	93762-80-2	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Alkenes, C15-C18	93762-80-2	EC50 (72h) > 1000 mg/L (Selenastrum capicomutum) (similar substance)	LL50 (96h) > 1000 mg/L (Oncorhynchus mykiss) (similar substance) LL50 (96h) > 10000 mg/L (Scopthalmus maximus) (similar substance)	No information available	EC50 (48h) > 1000 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Alkenes, C15-C18	93762-80-2	Readily biodegradable (77 - 81% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Alkenes, C15-C18	93762-80-2	> 7

12.4. Mobility in soil

Substances	CAS Number	Mobility
Alkenes, C15-C18	93762-80-2	KOC >5

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 07-Nov-2019

Revision Note

SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3

H304 - May be fatal if swallowed and enters airways
EUH066 - Repeated exposure may cause skin dryness or cracking

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour

mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID
OSHA
ECHA C&L

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BaraCor® 100

Revision Date: 18-Jun-2020 **Revision Number:** 61

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BaraCor® 100

Other means of Identification

Synonyms None

Hazardous Material Number: HM003391

Recommended use of the chemical and restrictions on use

Recommended Use Corrosion Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Carcinogenicity	Category 2 - H351
Reproductive Toxicity	Category 1B - H360
Specific Target Organ Toxicity - (Single Exposure)	Category 1 - H370
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word	DANGER
Hazard Statements:	H226 - Flammable liquid and vapor H302 - Harmful if swallowed H315 - Causes skin irritation H317 - May cause an allergic skin reaction H318 - Causes serious eye damage H351 - Suspected of causing cancer H360 - May damage fertility or the unborn child H370 - Causes damage to organs
Precautionary Statements	
Prevention	P201 - Obtain special instructions before use P202 - Do not handle until all safety precautions have been read and understood P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P233 - Keep container tightly closed P240 - Ground and bond container and receiving equipment. P241 - Use explosion-proof electrical/ventilating/lighting/equipment P242 - Use only non-sparking tools P243 - Take action to prevent static discharges. P260 - Do not breathe dust/fume/gas/mist/vapors/spray P264 - Wash face, hands and any exposed skin thoroughly after handling P270 - Do not eat, drink or smoke when using this product P272 - Contaminated work clothing should not be allowed out of the workplace P280 - Wear protective gloves/eye protection/face protection P281 - Use personal protective equipment as required
Response	P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell P330 - Rinse mouth P302 + P352 - IF ON SKIN: Wash with plenty of water. P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention P363 - Wash contaminated clothing before reuse P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing P310 - Immediately call a POISON CENTER or doctor/physician P307 + P311 - IF exposed: Call a POISON CENTER or doctor/physician P370 + P378 - In case of fire: Use water spray for extinction
Storage	P403 + P235 - Store in a well-ventilated place. Keep cool P405 - Store locked up
Disposal	P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3
Methanol	67-56-1
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	**CAS Number**	**PERCENT (w/w)**	**GHS Classification - Australia**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	10 - 30%	Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Skin Sens. 1 (H317)
Methanol	67-56-1	10 - 30%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) STOT SE 1 (H370) Flam. Liq. 2 (H225)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	1 - 5%	Acute Tox. 4 (H302) Eye Irrit. 2A (H319) Carc. 2 (H351)

4. First aid measures

Description of necessary first aid measures

Inhalation Remove person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, get immediate medical attention.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek immediate medical attention/advice. Suitable emergency eye wash facility should be immediately available

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention.

Ingestion Following ingestion, onset of symptoms may be delayed by 12 to 24 hours. Admission to hospital should be the first priority even if symptoms are absent. Do NOT induce vomiting. Rinse mouth. Never give anything by mouth to an unconscious person. Obtain immediate medical attention.

Symptoms caused by exposure

Harmful if swallowed. Harmful in contact with skin. Harmful if inhaled. Causes skin irritation. Causes severe eye irritation which may damage tissue. May cause allergic skin reaction. Potential carcinogen. May cause damage to internal organs.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Ensure adequate ventilation. Use appropriate protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Remove sources of ignition. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up
Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers. Remove ignition sources and work with non-sparking tools.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Do not breathe dust/fume/gas/mist/vapors/spray. Ensure adequate ventilation. Use appropriate protective equipment. Remove sources of ignition. Ground and bond containers when transferring from one container to another. Avoid contact with eyes, skin, or clothing.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool well ventilated area. Keep from heat, sparks, and open flames.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	Not applicable	Not applicable
Methanol	67-56-1	TWA: 200 ppm TWA: 262 mg/m^3 STEL: 250 ppm STEL: 328 mg/m^3	TWA: 200 ppm STEL: 250 ppm
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Ensure adequate ventilation, especially in confined areas

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Positive pressure self-contained breathing apparatus.
Hand Protection	Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Neoprene gloves. Nitrile gloves. Butyl rubber gloves. This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types. Impervious gloves
Skin Protection	Rubber apron. Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Brown
Odor:	Alcohol	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	9-11
Freezing Point / Range	-23 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	33 °C / 92 °F (PMCC)
Upper flammability limit	36%
Lower flammability limit	6%
Evaporation rate	1.6
Vapor Pressure	No data available
Vapor Density	> 1
Specific Gravity	1.01
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	-0.84
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers. Strong acids. Strong alkalis.
10.6. Hazardous decomposition products
Ammonia. Oxides of nitrogen. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Harmful if swallowed. Harmful in contact with skin. Harmful if inhaled. Causes skin irritation. Causes severe eye irritation which may damage tissue. May cause allergic skin reaction. Potential carcinogen. May cause damage to internal organs.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	3816 mg/kg-bw (rat)	> 2000 mg/kg (Rat)	No toxicity at saturation (rat, 8 h, vapour)
Methanol	67-56-1	300 mg/kg-bw (human) < 790 to 13,000 mg/kg (rat)	1000 mg/kg-bw (human) 17,100 mg/kg (rabbit)	10 mg/L (human, vapor, 4h)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	1740 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5 mg/L (Rat, Aerosol, 4h)

Immediate, delayed and chronic health effects from exposure
Inhalation May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. Harmful if inhaled.
Eye Contact Causes serious eye damage.
Skin Contact Harmful in contact with skin. Causes skin irritation. May cause an allergic skin reaction.
Ingestion Ingestion of this product may cause blindness due to the presence of methanol. Harmful if swallowed.

Chronic Effects/Carcinogenicity Contains known or suspected carcinogens. Contains nitrilotriacetic acid or its salts, which is NTP Classification 2 (Reasonably Anticipated to be a Human Carcinogen) and IARC Classification 2B (a Possible Human Carcinogen)

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	Causes moderate skin irritation. (Rabbit) Skin, rabbit:
Methanol	67-56-1	Non-irritating to the skin (Rabbit)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Non-irritating to the skin (Rabbit) Not irritating to skin in rabbits. Skin, rabbit:

Substances	CAS Number	Serious eye damage/irritation
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	Causes eye burns Causes severe eye irritation. Will damage tissue.
Methanol	67-56-1	Non-irritating to the eye (Rabbit)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Irritating to eyes (Rabbit) Eye, rabbit: Causes moderate eye irritation

Substances	CAS Number	Skin Sensitization
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	May cause sensitization by skin contact (mouse)
Methanol	67-56-1	Did not cause sensitization on laboratory animals (guinea pig)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	No information available
Methanol	67-56-1	No information available
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	No information available

Substances	CAS Number	Mutagenic Effects
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
Methanol	67-56-1	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Not regarded as mutagenic. In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects

Substances	CAS Number	Carcinogenic Effects
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	No information available
Methanol	67-56-1	No data of sufficient quality are available.
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Contains nitrilotriacetic acid or its salts, which is listed as a suspect carcinogen of the urinary tract and kidneys by NTP, based on feeding studies with laboratory animals. According to the ACGIH guidelines, NTA would "not be considered an occupational carcinogen of any significance." IARC cancer review classification: 2B (Possibly Carcinogenic to Humans) Available data indicate that this substance is a suspected carcinogen.

Substances	CAS Number	Reproductive toxicity
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.
Methanol	67-56-1	Based on available data, the classification criteria are not met. Experiments have shown reproductive toxicity effects on laboratory animals
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	No significant toxicity observed in animal studies at concentration requiring classification.
Methanol	67-56-1	May cause disorder and damage to the Central Nervous System (CNS)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	No significant toxicity observed in animal studies at concentration requiring classification.
Methanol	67-56-1	No data of sufficient quality are available.
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	Not applicable
Methanol	67-56-1	Not applicable
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	EC50 (72 h) =100 mg/L (Skeletonema costatum) EC50 (72 h) >120 mg/L (Desmodesmus subspicatus) NOEC (72 h) >120 mg/L (Desmodesmus subspicatus)	LC50 (96 h) >100 mg/L (Scophthalmus maximus) LC50 (96 h) =681.1 mg/L (Leuciscus idus)	EC50 (3h) > 1000 mg/L (activated sludge)	LC50 (48 h) =287.2 mg/L (Acartia tonsa) EC50 (48 h) >120 mg/L (Daphnia Magna)
Methanol	67-56-1	EC50 (96 h) =22000 mg/L (Pseudokirchnerella subcapitata) NOEC (8 d) =8000 mg/L (Scenedesmus quadricauda)	LC50(96 h)=15400 mg/L (Lepomis macrochirus) EC50 (200h)=14536 mg/L (Oryzias latipes)	No information available	NOEC(21 d)=208 mg/L (Daphnia magna) EC50 (48h)=22200 mg/L (Daphnia obtuse)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	EC50 (72 h) >91.5 mg/L (Desmodesmus subspicatus) EC50 (72h) 73.4 mg/L (Skeletonema costatum)	TL50 (96 h) =103 mg/L (Pimephales promelas) LC50 (96h) > 73.4 mg/L (Scophthalmus maximus) NOEC (229 d) >54 mg/L (Pimephales promelas)	NOEC (90d) >200 mg/L (activated sludge)	TL50 (96 h) range115 mg/L (Gammarus pseudolimnaeus) EC50 (48h) 171.1 mg/L (Acartia tonsa) NOEC (147 d) =9.3 mg/L (Gammarus pseudolimnaeus)

12.2. Persistence and degradability

Not readily biodegradable

Substances	CAS Number	Persistence and Degradability
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	(10.2% @ 28d)
Methanol	67-56-1	Readily biodegradable (95% @ 20d)
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	Readily biodegradable (100% @ 14d) Marine water Persistent (6.6% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	Log Pow <1
Methanol	67-56-1	Not Bioaccumulative; BCF=1
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	-2.62 (calculated)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues	68909-77-3	No information available
Methanol	67-56-1	No information available
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable
EMS: EmS F-E, S-E

IATA/ICAO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

•3Y

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 18-Jun-2020

Revision Note

SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3

H225 - Highly flammable liquid and vapor
H226 - Flammable liquid and vapor
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H311 - Toxic in contact with skin
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H332 - Harmful if inhaled
H351 - Suspected of causing cancer
H370 - Causes damage to organs

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%

LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CON DET®

Revision Date: 09-Sep-2020 **Revision Number:** 28

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CON DET®

Other means of Identification

Synonyms None

Hazardous Material Number: HM003454

Recommended use of the chemical and restrictions on use

Recommended Use Anionic Surfactant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319
Acute Aquatic Toxicity	Category 3 - H402

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements:
H319 - Causes serious eye irritation
H402 - Harmful to aquatic life

Precautionary Statements

Prevention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear eye protection/face protection

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7
Isopropanol	67-63-0
Potassium pyrophosphate	7320-34-5
Potassium hydroxide	1310-58-3

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	**CAS Number**	**PERCENT (w/w)**	**GHS Classification - Australia**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	5 - 10%	Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 2 (H411)
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	1 - 5%	Eye Irrit. 2 (H319)
Isopropanol	67-63-0	1 - 5%	Eye Irrit. 2 (H319) STOT SE 3 (H336) Flam. Liq. 2 (H225)
Potassium pyrophosphate	7320-34-5	1 - 5%	Eye Irrit. 2A (H319)
Potassium hydroxide	1310-58-3	0.1 - 1%	Acute Tox. 4 (H302) Skin Corr. 1 (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Flush skin with large amounts of water. If irritation persists, get medical attention.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes mild skin irritation. Causes eye irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Not applicable	Not applicable
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	Not applicable	Not applicable
Isopropanol	67-63-0	TWA: 400 ppm TWA: 983 mg/m^3 STEL: 500 ppm STEL: 1230 mg/m^3	TWA: 200 ppm STEL: 400 ppm
Potassium pyrophosphate	7320-34-5	Not applicable	Not applicable
Potassium hydroxide	1310-58-3	Not applicable	Ceiling: 2 mg/m^3

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid
Odor: Alcohol
Color Transparent Red
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	9.5 @ 1%
Freezing Point / Range	-2.2 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	99 °C / 210 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.025
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes mild skin irritation. Causes eye irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	>5000 mg/kg-bw (rat)	>2000 mg/kg-bw (rabbit)	No data available
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	7200 mg/kg (Rat) > 7000 mg/kg (Rat)	>2000 mg/kg (Rabbit)	>6.41 mg/L (Rabbit) 3.87h (similar substance)
Isopropanol	67-63-0	4700 mg/kg-bw (rat)	12870 mg/kg-bw (rabbit)	72.6 mg/L (Rat, 4h, vapor)
Potassium pyrophosphate	7320-34-5	2440 mg/kg (Rat) (similar substance)	4640 mg/kg (Rabbit) > 2000 mg/kg (Rat)	> 1.1 mg/L (Rat) 4h (saturated concentration)
Potassium hydroxide	1310-58-3	333 mg/kg (Rat)	No data available	No data available

Immediate, delayed and chronic health effects from exposure
Inhalation May cause mild respiratory irritation.
Eye Contact Causes eye irritation.
Skin Contact Causes mild skin irritation.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Irritating to skin. (Rabbit)
Benzenesulfonic acid,	1300-72-7	Not irritating to skin in rabbits.

dimethyl-, sodium salt		
Isopropanol	67-63-0	Non-irritating to the skin (Rabbit)
Potassium pyrophosphate	7320-34-5	Not irritating to skin in rabbits.
Potassium hydroxide	1310-58-3	Corrosive to skin (Rabbit)

Substances	**CAS Number**	**Serious eye damage/irritation**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Causes severe eye irritation (Rabbit) (similar substances)
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	Eye, rabbit: Causes moderate eye irritation
Isopropanol	67-63-0	Causes moderate eye irritation (Rabbit)
Potassium pyrophosphate	7320-34-5	Eye, rabbit: Causes moderate eye irritation
Potassium hydroxide	1310-58-3	Corrosive to eyes (Rabbit)

Substances	**CAS Number**	**Skin Sensitization**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Did not cause sensitization on laboratory animals (guinea pig)
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Isopropanol	67-63-0	Did not cause sensitization on laboratory animals (guinea pig)
Potassium pyrophosphate	7320-34-5	Did not cause sensitization on laboratory animals (mouse) (similar substances)
Potassium hydroxide	1310-58-3	Did not cause sensitization on laboratory animals (guinea pig)

Substances	**CAS Number**	**Respiratory Sensitization**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	No information available
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	No information available
Isopropanol	67-63-0	No information available
Potassium pyrophosphate	7320-34-5	No information available
Potassium hydroxide	1310-58-3	No information available

Substances	**CAS Number**	**Mutagenic Effects**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	In vitro tests did not show mutagenic effects Some in vivo tests have shown mutagenic effects.
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	While some in vitro tests were positive and/or equivocal, in vivo results were negative. (similar substances)
Isopropanol	67-63-0	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
Potassium pyrophosphate	7320-34-5	In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects. (similar substances)
Potassium hydroxide	1310-58-3	Not regarded as mutagenic.

Substances	**CAS Number**	**Carcinogenic Effects**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	No data of sufficient quality are available.
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	Did not show carcinogenic effects in animal experiments (Rat)
Isopropanol	67-63-0	Did not show carcinogenic effects in animal experiments
Potassium pyrophosphate	7320-34-5	No information available
Potassium hydroxide	1310-58-3	No data of sufficient quality are available.

Substances	**CAS Number**	**Reproductive toxicity**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Did not show teratogenic effects in animal experiments.
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	Did not show teratogenic effects in animal experiments.
Isopropanol	67-63-0	Animal testing did not show any effects on fertility.
Potassium pyrophosphate	7320-34-5	Did not show teratogenic effects in animal experiments. (similar substances)
Potassium hydroxide	1310-58-3	Not applicable due to corrosivity of the substance.

Substances	**CAS Number**	**STOT - single exposure**
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	No significant toxicity observed in animal studies at concentration requiring classification.
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Isopropanol	67-63-0	May cause headache, dizziness, and other central nervous system effects.

Potassium pyrophosphate	7320-34-5	No significant toxicity observed in animal studies at concentration requiring classification.
Potassium hydroxide	1310-58-3	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	No data of sufficient quality are available.
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Isopropanol	67-63-0	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Potassium pyrophosphate	7320-34-5	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Potassium hydroxide	1310-58-3	Not applicable due to corrosivity of the substance.

Substances	CAS Number	Aspiration hazard
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Not applicable
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	Not applicable
Isopropanol	67-63-0	Not applicable
Potassium pyrophosphate	7320-34-5	Not applicable
Potassium hydroxide	1310-58-3	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	EC50(72h) 2.2 mg/L (Scenedesmus subspicatus)	LC50(96h) 3.6 mg/L (Brachydanio rerio) NOEC(28d)=0.32 mg/L (Oncorhynchus mykiss)	No information available	EC50(48h) 2.25 mg/L (Ceriodaphnia dubia) NOEC(21d) 0.07 mg/L (Daphnia magna)
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	EC50 (96h) >230 mg/L (Pseudokirchnerella subcapitata)	LC50 (96h) >1580 mg/L (Oncorhynchus mykiss)	EC10 (3h) > 1000 mg/L (Activated sludge, domestic)	EC50 (48h) >1000 mg/L (Daphnia magna)
Isopropanol	67-63-0	EC50 (72h) > 1000 mg/L (Desmodesmus subspicatus) EC50 (7d) 1800 mg/L (meanextinction value)(Scenedesmus quadricauda)	LC50 (96h) 9640 mg/L (Pimephales promelas) LC50 (7d) 7060 mg/L (Poecilia reticulata)	TT (16h) 1050 mg/L (Pseudomonas putida)	EC50 (48 h)=2285 mg/L (Daphnia sp.) EC50 (24h) > 10,000 mg/L (Daphnia magna)
Potassium pyrophosphate	7320-34-5	EC50 (72h) > 100 mg/L (Desmodesmus subspicatus)	LC50 (96h) > 100 mg/L (Oncorhynchus mykiss) (similar substance)	No information available	EC50 (48h) > 100 mg/L (Daphnia magna)
Potassium hydroxide	1310-58-3	No information available	NOEC (24h) 28 mg/L (Lepomis macrochirus)	No information available	EC100 (48h) > 10 mg/L (Dreissena polymorpha)(similar substance)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Readily biodegradable (92.5% @ 28d)
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	(84% @ 28d)
Isopropanol	67-63-0	Readily biodegradable (53% @ 5d)
Potassium pyrophosphate	7320-34-5	The methods for determining biodegradability are not applicable to inorganic substances.
Potassium hydroxide	1310-58-3	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	Not Bioaccumulative; BCF=65.4 L/kg (similar substance)
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	-3.12
Isopropanol	67-63-0	LogPow < 4.5
Potassium pyrophosphate	7320-34-5	No information available
Potassium hydroxide	1310-58-3	Not Bioaccumulative

12.4. Mobility in soil

Substances	CAS Number	Mobility
Amides, coco, N,N-bis (hydroxyethyl)	68603-42-9	No information available
Benzenesulfonic acid, dimethyl-, sodium salt	1300-72-7	KOC = 1.0 (estimated)
Isopropanol	67-63-0	No information available
Potassium pyrophosphate	7320-34-5	Soluble in water
Potassium hydroxide	1310-58-3	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 09-Sep-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H272 - May intensify fire; oxidizer
H290 - May be corrosive to metals
H225 - Highly flammable liquid and vapor
H314 - Causes severe skin burns and eye damage
H315 - Causes skin irritation
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation
H336 - May cause drowsiness or dizziness
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%

LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BARABLOK™

Revision Date: 30-Apr-2020 **Revision Number:** 28

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BARABLOK™

Other means of Identification

Synonyms None

Hazardous Material Number: HM003477

Recommended use of the chemical and restrictions on use

Recommended Use Fluid Loss Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color**	Black
Odor:	Asphalt	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	5.8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	315 °C / 599 °F Cleveland Open Cup (COC)
Lower flammability limit	0.02 oz/ft3
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.05
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	1.7-1.9
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	2800 cPs
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	2%
Bulk Density	30 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Toxic fumes.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in	NA	No data available	No data available	No data available

concentrations above cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BARABUF®

Revision Date: 21-Aug-2017 **Revision Number:** 32

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BARABUF®

Other means of Identification

Synonyms None

Hazardous Material Number: HM003483

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required. If swallowed, observe victim for 24 hours; seek medical attention if indicated.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Not applicable

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid creating and breathing dust. Ensure

adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Wash hands after use. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Product has a shelf life of 12 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Appropriate engineering controls

Engineering Controls	A well ventilated area to control dust levels.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally necessary. However, if significant exposures are likely then wear a Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Not normally necessary.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	10.5
Freezing Point / Range	> 2100 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available

Specific Gravity	3.56
Water Solubility	Partly soluble
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids. Avoid halogens. Prolonged contact with aluminum.
10.6. Hazardous decomposition products
Metal oxides.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure	Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Immediate, delayed and chronic health effects from exposure

Inhalation	May cause mild respiratory irritation.
Eye Contact	May cause mechanical irritation to eye.
Skin Contact	Not irritating to skin in rabbits.
Ingestion	May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Allergic skin and/or respiratory reaction. Liver and kidney disorders.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

12.2. Persistence and degradability

12.3. Bioaccumulative potential

12.4. Mobility in soil

12.6. Other adverse effects
Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging
Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted

Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 21-Aug-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%

mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BaraCor® 95

Revision Date: 18-Jun-2020 **Revision Number:** 49

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BaraCor® 95

Other means of Identification

Synonyms None

Hazardous Material Number: HM003499

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute toxicity - Dermal	Category 4 - H312
Acute inhalation toxicity - vapor	Category 4 - H332
Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Acute Aquatic Toxicity	Category 3 - H402
Chronic Aquatic Toxicity	Category 3 - H412

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H302 - Harmful if swallowed
H312 - Harmful in contact with skin
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H402 - Harmful to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements

Prevention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P312 - Call a POISON CENTER/doctor/physician if you feel unwell
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Monoethanolamine	141-43-5

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Monoethanolamine	141-43-5	60 - 100%	Acute Tox. 4 (H302) Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Corr. 1B (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412) Flam. Liq. 4 (H227)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe skin burns and eye damage. May cause respiratory irritation. Harmful if inhaled. Harmful in contact with skin. Harmful if swallowed.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce harmful gases. Do not allow runoff to enter waterways.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 36 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Monoethanolamine	141-43-5	TWA: 3 ppm TWA: 7.5 mg/m^3 STEL: 6 ppm STEL: 15 mg/m^3	TWA: 3 ppm STEL: 6 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. In high concentrations, supplied air respirator or a self-contained breathing apparatus. (EN137:2006, 2)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 8 mm thickness)

This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Rubber apron. Rubber boots.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid
Color Colorless
Odor: Amine
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	12
Freezing Point / Range	-13 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	130 °C / 266 °F
Flash Point	96 °C / 205 °F (PMCC)
Evaporation rate	0.1
Vapor Pressure	0.2 mmHg @ 20°C
Vapor Density	2.1 (air = 1)
Specific Gravity	1.02
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	-1.9
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids. Strong oxidizers.
10.6. Hazardous decomposition products
Ammonia. Carbon monoxide and carbon dioxide. Hydrocarbons.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe skin burns and eye damage. May cause respiratory irritation. Harmful if inhaled. Harmful in contact with skin. Harmful if swallowed.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Monoethanolamine	141-43-5	1089 mg/kg-bw (rat)	1025 mg/kg-bw (rabbit)	>1.3 mg/L (rat, 6 h, vapor) (saturated)

Immediate, delayed and chronic health effects from exposure

Inhalation Harmful if inhaled. Causes severe respiratory irritation.
Eye Contact Causes eye damage.
Skin Contact Harmful in contact with skin. Causes severe burns.
Ingestion Harmful if swallowed. Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders. Lung disorders. Liver and kidney disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Monoethanolamine	141-43-5	Skin, rabbit: Corrosive to skin Causes severe skin burns

Substances	CAS Number	Serious eye damage/irritation
Monoethanolamine	141-43-5	Eye, rabbit: Corrosive to eyes Causes severe eye irritation. Will damage tissue.

Substances	CAS Number	Skin Sensitization
Monoethanolamine	141-43-5	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Monoethanolamine	141-43-5	No information available

Substances	CAS Number	Mutagenic Effects
Monoethanolamine	141-43-5	In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Monoethanolamine	141-43-5	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Monoethanolamine	141-43-5	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Monoethanolamine	141-43-5	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Monoethanolamine	141-43-5	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Monoethanolamine	141-43-5	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Monoethanolamine	141-43-5	EC50 (72 h) =2.5 mg/L (Pseudokirchneriella subcapitata) EC50 (72 h) =24.7 mg/L	LC50 (96 h) =170 mg/L (Carassius auratus) NOEC (14 d) >100 mg/L (Oryzias latipes)	No information available	EC50 (48 h) =65 mg/L (Daphnia magna) NOEC (21 d) =0.85 mg/L (Daphnia magna)

		(Phaeodactylum tricornutum)			

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Monoethanolamine	141-43-5	Readily biodegradable (92% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Monoethanolamine	141-43-5	Log Pow =-1.91

12.4. Mobility in soil

Substances	CAS Number	Mobility
Monoethanolamine	141-43-5	KOC = 0.2725 KOC = 1.167

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN2491
UN proper shipping name: Ethanolamine Solution
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN2491
UN proper shipping name: Ethanolamine Solution
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable
EMS: EmS F-A, S-B

IATA/ICAO

UN Number UN2491
UN proper shipping name: Ethanolamine Solution
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 18-Jun-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H312 - Harmful in contact with skin
H314 - Causes severe skin burns and eye damage
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H412 - Harmful to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter

NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BaraDeFoam® HP

Revision Date: 10-Apr-2020 **Revision Number:** 22

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BaraDeFoam® HP

Other means of Identification

Synonyms None

Hazardous Material Number: HM003504

Recommended use of the chemical and restrictions on use

Recommended Use Defoamer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Keep floors clean of spills.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 36 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally necessary.

Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear colorless to pale yellow
Odor:	Mild sweet	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	-15 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 182 °C / > 357 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	< 0.01 mmHg
Vapor Density	> 1
Specific Gravity	1
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong oxidizers. Isocyanates. Strong acids.

10.6. Hazardous decomposition products

Aldehydes. Ketones. Organic acid vapors. Hydrocarbons. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Heated vapors may cause respiratory irritation.
Eye Contact	May cause mild eye irritation.
Skin Contact	Prolonged or repeated contact may cause skin irritation.
Ingestion	None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 10-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BARAZAN® D PLUS

Revision Date: 30-Apr-2020 **Revision Number:** 33

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BARAZAN® D PLUS

Other means of Identification

Synonyms None

Hazardous Material Number: HM003535

Recommended use of the chemical and restrictions on use

Recommended Use Viscosifier

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Slippery when wet. Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color**	White to off white
Odor:	Slight	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	7 (1%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.6
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	204 °C / 400 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	1000000
VOC Content (%)	No data available
Bulk Density	52.4 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above	NA	No data available	No data available	No data available

cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May impede respiration.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.

Canadian Domestic Substances List (DSL) All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID
WHO/FAO

Disclaimer Statement

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BARAZAN® D PLUS

Revision Date: 30-Apr-2020 **Revision Number:** 33

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BARAZAN® D PLUS

Other means of Identification

Synonyms None

Hazardous Material Number: HM003535

Recommended use of the chemical and restrictions on use

Recommended Use Viscosifier

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Slippery when wet. Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color**	White to off white
Odor:	Slight	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	7 (1%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.6
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	204 °C / 400 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	1000000
VOC Content (%)	No data available
Bulk Density	52.4 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above	NA	No data available	No data available	No data available

cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May impede respiration.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.

Canadian Domestic Substances List (DSL) All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID
WHO/FAO

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BAROFIBRE®

Revision Date: 30-Apr-2020 **Revision Number:** 34

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BAROFIBRE®

Other means of Identification

Synonyms None

Hazardous Material Number: HM003539

Recommended use of the chemical and restrictions on use

Recommended Use Lost Circulation Material

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation Under normal conditions, first aid procedures are not required. Move person to fresh air.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Under normal conditions, first aid procedures are not required.
Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid creating and breathing dust. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a dry location. Product has a shelf life of 36 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Safety glasses.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid Powder
Color Tan
Odor: Odorless
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	4.9 (1%)
Freezing Point / Range	190 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	193 °C / 380 °F (PMCC)
Lower flammability limit	0.29
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.3
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Bulk Density	24-31 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to	NA	No information available

the competent authority		

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components are listed on the AICS or are subject to a relevant exemption, permit, or

	assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BAROID® RIG WASH

Revision Date: 13-Apr-2020 **Revision Number:** 21

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BAROID® RIG WASH

Other means of Identification

Synonyms None

Hazardous Material Number: HM003549

Recommended use of the chemical and restrictions on use

Recommended Use Surfactant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 1 - H318

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements: H318 - Causes serious eye damage

Precautionary Statements

Prevention P280 - Wear eye protection/face protection
Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
Storage None
Disposal None

Contains

Substances	**CAS Number**
Polyethylene glycol monoundecyl	34398-01-1
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8
Isopropanol	67-63-0

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Polyethylene glycol monoundecyl	34398-01-1	10 - 30%	Acute Tox. 4 (H302) Eye Corr. 1 (H318)
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	5 - 10%	Acute Tox. 4 (H302) Eye Corr. 1 (H318) STOT RE 2 (H373) Met. Corr. 1 (H290)
Isopropanol	67-63-0	1 - 5%	Eye Irrit. 2 (H319) STOT SE 3 (H336) Flam. Liq. 2 (H225)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek immediate medical attention/advice. Suitable emergency eye wash facility should be immediately available
Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.
Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes mild skin irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Polyethylene glycol monoundecyl	34398-01-1	Not applicable	Not applicable
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Not applicable	Not applicable
Isopropanol	67-63-0	TWA: 400 ppm TWA: 983 mg/m^3 STEL: 500 ppm STEL: 1230 mg/m^3	TWA: 200 ppm STEL: 400 ppm

Appropriate engineering controls

Engineering Controls	Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Organic vapor respirator.
Hand Protection	Impervious rubber gloves.
Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear blue
Odor:	Slight Alcohol	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	9.5
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	> 100 °C / > 212 °F
Flash Point	> 104 °C / > 219 °F Cleveland Open Cup (COC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.025
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Oxides of sulfur. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes mild skin irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyethylene glycol monoundecyl	34398-01-1	500 mg/kg (Rat)	2000 - 5000 mg/kg (similar substances)	No data available
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	1658 mg/kg-bw (Rat)	No information available	>1 mg/L (rat, saturated mist, 4hr) (similar substances)
Isopropanol	67-63-0	4700 mg/kg-bw (rat)	12870 mg/kg-bw (rabbit)	72.6 mg/L (Rat, 4h, vapor)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes mild skin irritation.

Ingestion May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Polyethylene glycol monoundecyl	34398-01-1	Skin, rabbit: Causes mild skin irritation
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Not irritating to skin in rabbits. (40 - 80 % solution)
Isopropanol	67-63-0	Non-irritating to the skin (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Polyethylene glycol monoundecyl	34398-01-1	Causes severe eye irritation which may damage tissue.
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Eye, rabbit: Causes serious eye damage (87 % solution)
Isopropanol	67-63-0	Causes moderate eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Polyethylene glycol monoundecyl	34398-01-1	Did not cause sensitization on laboratory animals (guinea pig)
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Isopropanol	67-63-0	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Polyethylene glycol monoundecyl	34398-01-1	No information available
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	No information available
Isopropanol	67-63-0	No information available

Substances	CAS Number	Mutagenic Effects
Polyethylene glycol monoundecyl	34398-01-1	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects (similar substances)
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects (similar substances)
Isopropanol	67-63-0	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Polyethylene glycol monoundecyl	34398-01-1	Did not show carcinogenic effects in animal experiments (similar substances)
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Did not show carcinogenic effects in animal experiments (similar substances)
Isopropanol	67-63-0	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Polyethylene glycol monoundecyl	34398-01-1	Not regarded as a reproductive and developmental toxicant. (similar substances)
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Isopropanol	67-63-0	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Polyethylene glycol monoundecyl	34398-01-1	No information available
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	May cause respiratory irritation. (similar substances) No significant toxicity observed in animal studies at concentration requiring classification.
Isopropanol	67-63-0	May cause headache, dizziness, and other central nervous system effects.

Substances	CAS Number	STOT - repeated exposure
Polyethylene glycol monoundecyl	34398-01-1	No significant toxicity observed in animal studies at concentration requiring classification.
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Causes damage to organs through prolonged or repeated exposure if inhaled: Respiratory system
Isopropanol	67-63-0	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Polyethylene glycol monoundecyl	34398-01-1	Not applicable
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Not applicable
Isopropanol	67-63-0	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Polyethylene glycol monoundecyl	34398-01-1	EC50 0.5 - 3.8 mg/L	LC50 (96h) 3900 mg/L (Pimephales promelas)	No information available	EC50 (96h) 2100 ug/L (Daphnia magna)
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	EC50 (72 h) >100 mg/L (Desmodesmus subspicatus)	LC50 (96 h) 121 mg/L (Lepomis macrochirus) NOAEL (96 h) 24 mg/L (Lepomis macrochirus)	No information available	EC50 (24 h) 610 mg/L (Daphnia magna)

Isopropanol	67-63-0	EC50 (72h) > 1000 mg/L (Desmodesmus subspicatus) EC50 (7d) 1800 mg/L (meanextinction value)(Scenedesmus quadricauda)	LC50 (96h) 9640 mg/L (Pimephales promelas) LC50 (7d) 7060 mg/L (Poecilia reticulata)	TT (16h) 1050 mg/L (Pseudomonas putida)	EC50 (48 h)=2285 mg/L (Daphnia sp.) EC50 (24h) > 10,000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Polyethylene glycol monoundecyl	34398-01-1	No information available
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	(10% @ 28d)
Isopropanol	67-63-0	Readily biodegradable (53% @ 5d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Polyethylene glycol monoundecyl	34398-01-1	Log Kow = 4
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	Log Pow Weighted average3.4
Isopropanol	67-63-0	LogPow < 4.5

12.4. Mobility in soil

Substances	CAS Number	Mobility
Polyethylene glycol monoundecyl	34398-01-1	No information available
Ethylenediaminetetraacetic acid, tetrasodium salt	64-02-8	No information available
Isopropanol	67-63-0	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 13-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H225 - Highly flammable liquid and vapor
H302 - Harmful if swallowed
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H336 - May cause drowsiness or dizziness
H373 - May cause damage to organs through prolonged or repeated exposure

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CAUSTIC SODA

Revision Date: 09-May-2017 **Revision Number:** 34

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CAUSTIC SODA

Other means of Identification

Synonyms None

Hazardous Material Number: HM003599

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Substances/mixtures corrosive to metal.	Category 1 - H290

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P234 - Keep only in original packaging.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P390 - Absorb spillage to prevent material damage
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P406 - Store in corrosive resistant container with a resistant inner liner.

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium hydroxide	1310-73-2

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium hydroxide	1310-73-2	60 - 100%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin	In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong acids. Reaction with steel and certain other metals generates flammable hydrogen gas.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid creating and breathing dust. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Neutralize to pH of 6-8. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store in a cool, dry location. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium hydroxide	1310-73-2	2 mg/m³	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Localized ventilation should be used to control dust levels.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Full protective chemical resistant clothing. Rubber boots

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Color White to off white
Odor: Odorless
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	14
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	1390 °C / 2535 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.13
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight 40

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Contact with acids. Peroxides. Halogenated compounds. Prolonged contact with aluminum, lead, or zinc may liberate flammable hydrogen.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	1310-73-2	Not applicable due to corrosivity of the substance.	Not applicable due to corrosivity of the substance.	Not applicable due to corrosivity of the substance.

Immediate, delayed and chronic health effects from exposure
Inhalation Causes severe respiratory irritation.
Eye Contact Causes severe eye irritation which may damage tissue.
Skin Contact Causes severe burns.
Ingestion Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium hydroxide	1310-73-2	Causes severe burns

Substances	CAS Number	Serious eye damage/irritation
Sodium hydroxide	1310-73-2	Causes severe eye burns (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium hydroxide	1310-73-2	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Sodium hydroxide	1310-73-2	No information available

Substances	CAS Number	Mutagenic Effects
Sodium hydroxide	1310-73-2	Did not show mutagenic effects in animal experiments In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium hydroxide	1310-73-2	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Sodium hydroxide	1310-73-2	No information available

Substances	CAS Number	STOT - single exposure
Sodium hydroxide	1310-73-2	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Sodium hydroxide	1310-73-2	No significant toxicity observed in animal studies at concentration requiring classification. Not applicable due to corrosivity of the substance.

Substances	CAS Number	Aspiration hazard
Sodium hydroxide	1310-73-2	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium hydroxide	1310-73-2	No information available	LC50(48h) 189 mg/L (Leuciscus idus melanotus) LLC50(48h) 189 mg/L (Leuciscus melanotus) LC50(24h) 145 mg/L (Poecilia reticulate) LC50(96h) 125 mg/L (Gambusia affinis) LOEL(150 d) = 25 mg/L (Lebistes reticulatus)	No information available	EC50 (48h) 40.4 mg/L (Ceriodaphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium hydroxide	1310-73-2	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Sodium hydroxide	1310-73-2	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium hydroxide	1310-73-2	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN1823
UN proper shipping name:	Sodium Hydroxide, Solid
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1823
UN proper shipping name:	Sodium Hydroxide, Solid
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN1823
UN proper shipping name:	Sodium Hydroxide, Solid
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
2W

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 09-May-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DEXTRID® LTE

Revision Date: 30-Apr-2020 **Revision Number:** 33

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DEXTRID® LTE

Other means of Identification

Synonyms None

Hazardous Material Number: HM003615

Recommended use of the chemical and restrictions on use

Recommended Use Fluid Loss Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word None

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential. Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid creating and breathing dust. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid dust accumulations. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 12 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Powder
Color White to off white
Odor: Musty
Odor Threshold: No information available

Property	Values	Remarks/ - Method
pH:	10	
Freezing Point / Range	No data available	
Melting Point / Range	No data available	
Pour Point / Range	No data available	
Boiling Point / Range	No data available	
Flash Point	No data available	
Evaporation rate	No data available	
Vapor Pressure	No data available	
Vapor Density	No data available	
Specific Gravity	1.5	
Water Solubility	Soluble in water	
Solubility in other solvents	No data available	
Partition coefficient: n-octanol/water	No data available	
Autoignition Temperature	No data available	
Decomposition Temperature	No data available	
Viscosity	No data available	
Explosive Properties	No information available	
Oxidizing Properties	No information available	

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Oxides of sulfur. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to	NA	No information available

the competent authority		

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components are listed on the AICS or are subject to a relevant exemption, permit, or

	assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

Product Trade Name: **DRIL-N-SLIDE™**

Revision Date: 27-Jun-2018 **Revision Number:** 20

1. Identification

1.1. Product Identifier

Product Trade Name: DRIL-N-SLIDE™
Synonyms None
Chemical Family Fatty Acid Ester
Internal ID Code HM003622

1.2 Recommended use and restrictions on use

Application Lubricant
Uses advised against No information available

1.3 Manufacturer's Name and Contact Details

Halliburton Energy Services, Inc.
645 - 7th Ave SW Suite 1800
Calgary, AB
T2P 4G8
Canada
Telephone: 1-403-231-9300

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000

Prepared By Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

1.4. Emergency telephone number

Emergency Telephone Number 1-866-519-4752 or 1-760-476-3962
Global Incident Response Access Code: 334305
Contract Number: 14012

2. Hazard Identification

2.1 Classification of the substance or mixture

As adopted by the competent authority, this product does not require an SDS or hazard warning label.

Not classified

2.2. Label Elements

Hazard Pictograms

Signal Word: Not Classified

Hazard Statements Not Hazardous

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

2.3 Other hazards which do not result in classification

None known

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Canada	HMIRA Registry Number	Filing Date	Decision Granted Date
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	80 - 100%	Not classified	Not applicable	Not applicable	Not applicable

The exact percentage (concentration) of the composition has been withheld as proprietary.

4. First aid measures

4.1. Description of first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration. Rinse mouth. Never give anything by mouth to an unconscious person.

4.2 Most important symptoms/effects, acute and delayed

No significant hazards expected.

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically.

5. Fire-fighting measures

5.1. Extinguishing media

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

5.2 Specific hazards arising from the substance or mixture

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

5.3 Special protective equipment and precautions for fire-fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.
See Section 8 for additional information

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and Storage

7.1. Precautions for safe handling

Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information
Keep container closed when not in use. Product has a shelf life of 36 months.

8. Exposure Controls/Personal Protection

8.1 Occupational Exposure Limits

Substances	CAS Number	OSHA PEL-TWA	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

8.2 Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

8.3 Individual protection measures, such as personal protective equipment

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally necessary.

Hand Protection Impervious rubber gloves. Nitrile gloves. Neoprene gloves. Butyl rubber gloves.
Skin Protection Normal work coveralls.
Eye Protection Safety glasses.
Other Precautions None known.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Yellowish
Odor: Bland **Odor** No information available

Threshold:

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	< -30 °C / < -22 °F
Melting Point / Range	No data available
Boiling Point / Range	240 °C / 464 °F
Flash Point	147 °C / 296 °F PMCC
Flammability (solid, gas)	No data available
Upper flammability limit	No data available
Lower flammability limit	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.86
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	1.69
Autoignition Temperature	240 °C / 464 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	0%
Liquid Density	7.18 lbs/gal
Bulk Density	53.69 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.

10.2. Chemical stability
Stable

10.3. Possibility of hazardous reactions
Will Not Occur

10.4. Conditions to avoid
None anticipated

10.5. Incompatible materials
Strong oxidizers.

10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

11.1 Information on likely routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

11.2 Symptoms related to the physical, chemical and toxicological characteristics
Acute Toxicity
Inhalation May cause mild respiratory irritation.

Eye Contact	May cause mild eye irritation.
Skin Contact	Not irritating to skin in rabbits.
Ingestion	Not determined

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

11.3 Toxicity data

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Substances	CAS Number	Skin corrosion/irritation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	Serious eye damage/irritation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	Skin Sensitization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	Respiratory Sensitization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	Mutagenic Effects
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	Carcinogenic Effects
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	Reproductive toxicity
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	STOT - single exposure
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	STOT - repeated exposure
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

Substances	CAS Number	Aspiration hazard
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	

12. Ecological Information

12.1. Toxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.5 Other adverse effects

No information available

13. Disposal Considerations

13.1. Waste treatment methods

Disposal methods Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. Transport Information

Canadian TDG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

US DOT

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable
Special Precautions for User None

15. Regulatory Information

Canadian Regulations

Canadian Domestic Substances List (DSL) All components listed on inventory or are exempt.

US Regulations

US TSCA Inventory All components listed on inventory or are exempt.

TSCA Significant New Use Rules - S5A2

Substances	CAS Number	TSCA Significant New Use Rules - S5A2
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

EPA SARA Title III Extremely Hazardous Substances

Substances	CAS Number	EPA SARA Title III Extremely Hazardous Substances
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

EPA SARA (311,312) Hazard Class
None

EPA SARA (313) Chemicals

Substances	CAS Number	Toxic Release Inventory (TRI) - Group I	Toxic Release Inventory (TRI) - Group II
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

EPA CERCLA/Superfund Reportable Spill Quantity

Substances	CAS Number	CERCLA RQ
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

EPA RCRA Hazardous Waste Classification
If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0, Flammability 0, Physical Hazard 0 , PPE: B

16. Other information

Preparation Information

Prepared By
Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

Revision Date: 27-Jun-2018

Reason for Revision SDS sections updated:
1

Additional information
For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key or legend to abbreviations and acronyms used in the safety data sheet
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
ErC50 – Effective Concentration growth rate 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PEL – Permissible Exposure Limit

ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
UN – United Nations
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

EZ-MUD®

Revision Date: 09-Sep-2020 **Revision Number:** 44

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name EZ-MUD®

Other means of Identification

Synonyms None

Hazardous Material Number: HM003643

Recommended use of the chemical and restrictions on use

Recommended Use Shale Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Hydrotreated light petroleum distillate	64742-47-8
Ethoxylated branched C13 alcohol	78330-21-9

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrotreated light petroleum distillate	64742-47-8	10 - 30%	Asp. Tox. 1 (H304)
Ethoxylated branched C13 alcohol	78330-21-9	1 - 5%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated shoes and discard.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes mild skin irritation.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Use water spray to cool fire exposed surfaces.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Keep container closed when not in use. Store locked up. Product has a shelf life of 12 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrotreated light petroleum distillate	64742-47-8	Not applicable	Not applicable
Ethoxylated branched C13 alcohol	78330-21-9	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Organic vapor respirator with a dust/mist filter. (A2P2/P3) In high concentrations, supplied air respirator or a self-contained breathing apparatus.
Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact

	(recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 8 mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	White to gray
Odor:	Mild hydrocarbon	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6-8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	175 °C / 347 °F
Flash Point	> 93 °C / > 200 °F (PMCC)
Evaporation rate	< 1
Vapor Pressure	0.002 mmHg
Vapor Density	No data available
Specific Gravity	1
Water Solubility	Partly soluble
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	> 200 °C / 392 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Ammonia. Oxides of nitrogen. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes mild skin irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrotreated light petroleum distillate	64742-47-8	>5000 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>5.2 mg/L (rat, 4 h, vapor) (similar substance)
Ethoxylated branched C13 alcohol	78330-21-9	1600 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>0.22 mg/L (rat, 4h, aerosol, saturated) (similar substance)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact In vitro tests indicate that the product is not an eye irritant.

Skin Contact Causes mild skin irritation.

Ingestion May cause mild gastric distress.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Lung disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrotreated light petroleum distillate	64742-47-8	Non-irritating to the skin (similar substances)
Ethoxylated branched C13 alcohol	78330-21-9	Skin, rabbit: Causes moderate skin irritation. (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Hydrotreated light petroleum distillate	64742-47-8	Non-irritating to rabbit's eye (similar substances)
Ethoxylated branched C13 alcohol	78330-21-9	Eye, rabbit: Causes severe eye irritation which may damage tissue. (similar substances)

Substances	CAS Number	Skin Sensitization
Hydrotreated light petroleum distillate	64742-47-8	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Ethoxylated branched C13 alcohol	78330-21-9	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Hydrotreated light petroleum distillate	64742-47-8	Based on available data, the classification criteria are not met.
Ethoxylated branched C13 alcohol	78330-21-9	Based on available data, the classification criteria are not met.

Substances	CAS Number	Mutagenic Effects
Hydrotreated light petroleum distillate	64742-47-8	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Ethoxylated branched C13	78330-21-9	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar

alcohol		substances)

Substances	CAS Number	Carcinogenic Effects
Hydrotreated light petroleum distillate	64742-47-8	Did not show carcinogenic effects in animal experiments (similar substances)
Ethoxylated branched C13 alcohol	78330-21-9	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Hydrotreated light petroleum distillate	64742-47-8	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Ethoxylated branched C13 alcohol	78330-21-9	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)

Substances	CAS Number	STOT - single exposure
Hydrotreated light petroleum distillate	64742-47-8	No significant toxicity observed in animal studies at concentration requiring classification.
Ethoxylated branched C13 alcohol	78330-21-9	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Hydrotreated light petroleum distillate	64742-47-8	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ethoxylated branched C13 alcohol	78330-21-9	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Hydrotreated light petroleum distillate	64742-47-8	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Ethoxylated branched C13 alcohol	78330-21-9	Based on available data, the classification criteria are not met.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrotreated light petroleum distillate	64742-47-8	ErL50(72 h)>10000 mg/L (Skeletonema costatum)	LC50(96 h)>10000 mg/L (Scophthalmus maximus) NOELR(28 d)>1000 mg/L (fish)	No information available	LC50(48 h)>10000 mg/L (Acartia tonsa) NOELR(21 d)=1000 mg/L (Daphnia magna)
Ethoxylated branched C13 alcohol	78330-21-9	IC50(72 h)=1-10 mg/L (Desmodesmus subspicatus)	LC50(96 h)=1-10 mg/L (Cyprinus carpio)	No information available	EC50(48 h)=1-10 mg/L (Daphnia magna) NOAEC (21d) 0.77 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Hydrotreated light petroleum distillate	64742-47-8	Readily biodegradable (68.1% @ 28d)
Ethoxylated branched C13 alcohol	78330-21-9	Readily biodegradable (> 60% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Hydrotreated light petroleum distillate	64742-47-8	No information available
Ethoxylated branched C13 alcohol	78330-21-9	Not Bioaccumulative; BCF = 12.7 - 237 L/Kg

12.4. Mobility in soil

Substances	CAS Number	Mobility

Hydrotreated light petroleum distillate	64742-47-8	No information available
Ethoxylated branched C13 alcohol	78330-21-9	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 09-Sep-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H318 - Causes serious eye damage
H412 - Harmful to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

EZ-MUD® DP

Revision Date: 20-Nov-2020 **Revision Number:** 28

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name EZ-MUD® DP

Other means of Identification

Synonyms None

Hazardous Material Number: HM003644

Recommended use of the chemical and restrictions on use

Recommended Use Shale Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Slippery when wet.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment. Slippery when wet.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Mild	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6-8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.8
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Bulk Density	40 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Ammonia. Oxides of nitrogen. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according	NA	No data available	No data available	No data available

to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 20-Nov-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

GEM™ CP

Revision Date: 15-Mar-2017 **Revision Number:** 21

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name GEM™ CP

Other means of Identification

Synonyms None

Hazardous Material Number: HM003659

Recommended use of the chemical and restrictions on use

Recommended Use Shale stabilizer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier

Multi-Chem Mintech
1 Ward Road
East Rockingham
WA 6168
Australia

Telephone Number: 61 (08) 9419 5300
Fax Number: 61 (08) 9439 1055
Emergency Telephone Number: + 61 1 800 686 951

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute inhalation toxicity - vapor	Category 4 - H332

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H332 - Harmful if inhaled

Precautionary Statements

Prevention P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area

Response P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER/doctor/physician if you feel unwell

Storage None

Disposal None

Contains

Substances	**CAS Number**
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	60 - 100%	Acute Tox. 4 (H332)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Harmful if inhaled.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid breathing vapors. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid breathing vapors. Avoid breathing mist. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Use appropriate protective equipment. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store away from acids. Store away from alkalis. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Organic vapor respirator with a dust/mist filter. (A2P2/P3)

Hand Protection Impervious rubber gloves. Polyvinylchloride gloves. Neoprene gloves.

Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear light yellow
Odor:	Mild	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	5-7.5 (10%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 93 °C / > 200 °F PMCC
Evaporation rate	< 0.1
Vapor Pressure	< 0.01 mmHg
Vapor Density	> 1
Specific Gravity	1.02
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	
Autoignition Temperature	370 °C / 698 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	405
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids. Strong alkalis.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Harmful if inhaled.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	>5000 mg/kg-bw (rat)	>8000 mg/kg-bw (rabbit)	>1 - <5 mg/L (rat, 4 h, aerosol)

Immediate, delayed and chronic health effects from exposure

Inhalation Harmful if inhaled.
Eye Contact Non-irritating to rabbit's eye
Skin Contact Not irritating to skin in rabbits.
Ingestion Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	Not a dermal irritant Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	Non-irritating to the eye

Substances	CAS Number	Skin Sensitization
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	No sensitization responses were observed (similar substances)

Substances	CAS Number	Respiratory Sensitization
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	No information available

Substances	CAS Number	Mutagenic Effects
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	No information available

Substances	CAS Number	Carcinogenic Effects
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	No information available

Substances	CAS Number	STOT - single exposure
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	No data of sufficient quality are available.

Substances	CAS Number	STOT - repeated exposure
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	No data of sufficient quality are available.

Substances	CAS Number	Aspiration hazard
Methyloxirane polymer with	9038-95-3	Not applicable

oxirane, monbutyl ether		

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	EC50(72 h)=465 mg/L (Skeletonema costatum)	LC50(96 h)=3200 mg/L (Pimephales promelas) LC50(96 h)>1800 mg/L (Scophthalmus maximus)	No information available	EC50(48 h)=4400 mg/L (Daphnia magna) LC50(48 h)=356 mg/L (Acartia tonsa)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	(24% @ 20d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	Log Pow=0.353

12.4. Mobility in soil

Substances	CAS Number	Mobility
Methyloxirane polymer with oxirane, monbutyl ether	9038-95-3	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 15-Mar-2017

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
H332 - Harmful if inhaled

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%

LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

GEM™ GP

Revision Date: 20-Jul-2020 **Revision Number:** 50

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name GEM™ GP

Other means of Identification

Synonyms None

Hazardous Material Number: HM003660

Recommended use of the chemical and restrictions on use

Recommended Use Shale stabilizer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 1 - H318

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements: H318 - Causes serious eye damage

Precautionary Statements

Prevention P280 - Wear eye protection/face protection
Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
Storage None
Disposal None

Contains

Substances	**CAS Number**
Polyethylene glycol butyl ether	9004-77-7

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Polyethylene glycol butyl ether	9004-77-7	60 - 100%	Eye Corr. 1 (H318)

4. First aid measures

Description of necessary first aid measures
Inhalation If inhaled, move victim to fresh air and seek medical attention.
Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes severe eye irritation which may damage tissue.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse. Ensure adequate ventilation. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store away from acids. Keep container closed when not in use.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Polyethylene glycol butyl ether	9004-77-7	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be

	performed by an Industrial Hygienist or other qualified professional. Organic vapor respirator.
Hand Protection	Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 8 mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Yellow to brown
Odor:	Mild	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6.5 - 9
Freezing Point / Range	-45 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	126 °C / 260 °F
Flash Point	166 °C / 330 °F (PMCC)
Upper flammability limit	3.8 %
Lower flammability limit	0.8 %
Evaporation rate	No data available
Vapor Pressure	0.002 mmHg
Vapor Density	No data available
Specific Gravity	1.012
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	203 °C / 397.4 °F
Decomposition Temperature	No data available
Viscosity	10-11 cP @ 20°C
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong oxidizers. Mineral acids.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyethylene glycol butyl ether	9004-77-7	> 5000 mg/kg (Rat) > 2000 mg/kg (Rat)	6540 mg/kg (Rat) 3540 mg/kg (Rabbit) (similar substance) > 2000 mg/kg (Rat) (similar substance)	> 2.6 mg/L (Rat) 4h (similar substance) > 2000 mg/L (Rat) 1h (similar substance)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Not irritating to skin in rabbits.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Lung disorders. Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Polyethylene glycol butyl ether	9004-77-7	Non-irritating to the skin (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Polyethylene glycol butyl ether	9004-77-7	Eye, rabbit: Causes severe eye irritation which may damage tissue.

Substances	CAS Number	Skin Sensitization
Polyethylene glycol butyl ether	9004-77-7	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Polyethylene glycol butyl ether	9004-77-7	No information available

Substances	CAS Number	Mutagenic Effects
Polyethylene glycol butyl ether	9004-77-7	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects

Polyethylene glycol butyl ether	9004-77-7	No information available

Substances	CAS Number	Reproductive toxicity
Polyethylene glycol butyl ether	9004-77-7	Not regarded as a reproductive and developmental toxicant. Did not show teratogenic effects in animal experiments. (similar substances)

Substances	CAS Number	STOT - single exposure
Polyethylene glycol butyl ether	9004-77-7	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Polyethylene glycol butyl ether	9004-77-7	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Polyethylene glycol butyl ether	9004-77-7	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Polyethylene glycol butyl ether	9004-77-7	EC50(72h): 391 mg/L (growth rate) (Skeletonema costatum)	EC50: 475 ppm (Abra alba) LC50(96h): >1800 mg/L (Scophthalmus maximus)	IC50(16h): > 5000 mg/L (Growth inhibition, Activated sludge) (similar substance – 2-(2-(2-butoxyethoxy)ethoxy)ethanol) EC10(30m): > 1995 mg/L (respiration rate, activated sludge) (similar substance – 2-(2-(2-butoxyethoxy)ethoxy)ethanol)	TLM48: 310 mg/l (Acartia tonsa) EC50(48h): > 3200 mg/L (Daphnia magna) (similar substance – ethanol, 2-butoxy-, manufacture of, by-products from)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Polyethylene glycol butyl ether	9004-77-7	Readily biodegradable (68% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Polyethylene glycol butyl ether	9004-77-7	0.436

12.4. Mobility in soil

Substances	CAS Number	Mobility
Polyethylene glycol butyl ether	9004-77-7	Log Kow < 4.5

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 20-Jul-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H318 - Causes serious eye damage

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SOURSCAV®

Revision Date: 09-Sep-2020 **Revision Number:** 31

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SOURSCAV®

Other means of Identification

Synonyms None

Hazardous Material Number: HM003675

Recommended use of the chemical and restrictions on use

Recommended Use Hydrogen Sulfide Scavenger

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
May be harmful if swallowed.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid creating and breathing dust. Ensure adequate ventilation.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from acids. Store away from oxidizers. Store in a cool, dry location. Keep container closed when not in use. Store away from direct sunlight. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls A well ventilated area to control dust levels.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Color Light yellow-green
Odor: Mild burnt sugar
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	4-5.5
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.73
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Metal oxides.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
May be harmful if swallowed.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according	NA	No data available	No data available	No data available

to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion May be harmful if swallowed. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential
Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 09-Sep-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

LIME

Revision Date: 21-Apr-2017 **Revision Number:** 49

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name LIME

Other means of Identification

Synonyms None

Hazardous Material Number: HM003683

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H315 - Causes skin irritation
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/eye protection/face protection

Response
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER/doctor/physician if you feel unwell
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains Substances	**CAS Number**
Calcium hydroxide	1305-62-0

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Calcium hydroxide	1305-62-0	60 - 100%	Skin Irrit. 2 (H315) Eye Corr. 1 (H318) STOT SE 3 (H335)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin	Remove contaminated clothing and launder before reuse. In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store in a cool, dry location. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Calcium hydroxide	1305-62-0	TWA: 5 mg/m³	TWA: 5 mg/m³

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 0.35 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Color White
Odor: Odorless
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	12.2
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.24
Water Solubility	Partly soluble
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	74.1
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause respiratory irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium hydroxide	1305-62-0	7340 mg/kg-bw (rat)	>2500 mg/kg-bw (rabbit)	No data available

Immediate, delayed and chronic health effects from exposure
Inhalation Causes moderate respiratory irritation.
Eye Contact Causes severe eye irritation which may damage tissue.
Skin Contact Causes skin irritation.
Ingestion Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Calcium hydroxide	1305-62-0	Causes moderate skin irritation. (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Calcium hydroxide	1305-62-0	Causes severe eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Calcium hydroxide	1305-62-0	Not regarded as a sensitizer.

Substances	CAS Number	Respiratory Sensitization
Calcium hydroxide	1305-62-0	No data of sufficient quality are available.

Substances	CAS Number	Mutagenic Effects
Calcium hydroxide	1305-62-0	In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Calcium hydroxide	1305-62-0	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Calcium hydroxide	1305-62-0	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)

Substances	CAS Number	STOT - single exposure
Calcium hydroxide	1305-62-0	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Calcium hydroxide	1305-62-0	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Calcium hydroxide	1305-62-0	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Calcium hydroxide	1305-62-0	No information available	LC50 (96 h) =50.6 mg/L (Oncorhynchus mykiss) LC50 (96 h) =457 mg/L (Gasterosteus aculeatus)	No information available	EC50 (48 h) =49.1 mg/L (Daphnia magna) EC50 (96 h) =158 mg/L (Crangon septemspinosa) NOAEC (14 d) =32 mg/L (Crangon septemspinosa)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Calcium hydroxide	1305-62-0	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Log Pow
Calcium hydroxide	1305-62-0	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Calcium hydroxide	1305-62-0	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Empty container completely. Transport with all closures in place. Return for reuse or dispose in a sanitary landfill according to

national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 21-Apr-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H315 - Causes skin irritation
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

N-DRIL® HT PLUS

Revision Date: 30-Apr-2020 **Revision Number:** 33

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name N-DRIL® HT PLUS

Other means of Identification

Synonyms None

Hazardous Material Number: HM003699

Recommended use of the chemical and restrictions on use

Recommended Use Fluid Loss Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	NF	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential. Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid dust accumulations. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool, dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Starch	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.5
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Bulk Density	30-35 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according	NA	No data available	No data available	No data available

to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List	All components listed on inventory or are exempt.

(DSL)

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
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conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

OXYGON™

Revision Date: 25-Mar-2020 **Revision Number:** 31

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name OXYGON™

Other means of Identification

Synonyms None

Hazardous Material Number: HM003723

Recommended use of the chemical and restrictions on use

Recommended Use Oxygen Scavenger

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Not applicable

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 36 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid Powder
Color White
Odor: Odorless
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	5.5-8 (5%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Upper flammability limit	0.5 oz/ft3
Lower flammability limit	0.28 oz/ft3
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.2
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	640 °C / 1184 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Bulk Density	45-65 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to	NA	No information available

the competent authority		

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components are listed on the AICS or are subject to a relevant exemption, permit, or

	assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 25-Mar-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

Potassium Chloride

Revision Date: 30-Mar-2017 **Revision Number:** 20

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name Potassium Chloride

Other means of Identification

Synonyms None

Hazardous Material Number: HM003741

Recommended use of the chemical and restrictions on use

Recommended Use Brine

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	NF	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Not applicable

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White to gray
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	9.2
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.99
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	74.5
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in	NA	No data available	No data available	No data available

concentrations above cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability
The methods for determining biodegradability are not applicable to inorganic substances.

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.

EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 30-Mar-2017

Revision Note
SDS sections updated: 1 7

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SAPP

Revision Date: 11-Feb-2021 **Revision Number:** 26

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SAPP

Other means of Identification

Synonyms None

Hazardous Material Number: HM003755

Recommended use of the chemical and restrictions on use

Recommended Use ThinnerControl Agent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Serious Eye Damage/Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements:
H302 - Harmful if swallowed
H319 - Causes serious eye irritation

Precautionary Statements

Prevention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P280 - Wear eye protection/face protection

Response
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium acid pyrophosphate	7758-16-9

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium acid pyrophosphate	7758-16-9	60 - 100%	Acute Tox. 4 (H302) Eye Irrit. 2A (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation. Harmful if swallowed.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Not applicable

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium acid pyrophosphate	7758-16-9	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection	Wear protective clothing appropriate for the work environment.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	4-4.6
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.04
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	223.96
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products

Oxides of phosphorus.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation. Harmful if swallowed.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium acid pyrophosphate	7758-16-9	1800 mg/kg (Rat) 2650 mg/kg (Mouse) 3600 mg/kg (Rat)	> 2000 mg/kg (Rat) > 7940 mg/kg (Rabbit)	0.58 mg/L (Rat) 4h > 0.58 mg/L (Mouse) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion Harmful if swallowed.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium acid pyrophosphate	7758-16-9	Non-irritating to the skin (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Sodium acid pyrophosphate	7758-16-9	Irritating to eyes (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium acid pyrophosphate	7758-16-9	Did not cause sensitization on laboratory animals (mouse)

Substances	CAS Number	Respiratory Sensitization
Sodium acid pyrophosphate	7758-16-9	No information available

Substances	CAS Number	Mutagenic Effects
Sodium acid pyrophosphate	7758-16-9	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium acid pyrophosphate	7758-16-9	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Sodium acid pyrophosphate	7758-16-9	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Sodium acid pyrophosphate	7758-16-9	No information available

Substances	CAS Number	STOT - repeated exposure
Sodium acid pyrophosphate	7758-16-9	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Sodium acid pyrophosphate	7758-16-9	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium acid pyrophosphate	7758-16-9	No information available	LC50 (48h) > 1500 mg/L (Goldorfen)	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium acid pyrophosphate	7758-16-9	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Sodium acid pyrophosphate	7758-16-9	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium acid pyrophosphate	7758-16-9	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 11-Feb-2021

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H319 - Causes serious eye irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

STEELSEAL®

Revision Date: 11-Dec-2019 **Revision Number:** 31

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name STEELSEAL®

Other means of Identification

Synonyms None

Hazardous Material Number: HM003768

Recommended use of the chemical and restrictions on use

Recommended Use Lost Circulation Material

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Rinse mouth. Never give anything by mouth to an unconscious person. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Combustible dust when in finely divided and highly suspended state.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid dust accumulations. Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and dark procedures for low oxygen levels should be taken to ensure ample oxygen availability. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a dry location. Keep from heat, sparks, and open flames. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls A well ventilated area to control dust levels.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Color Dark gray
Odor: Odorless
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	4200 °C / 7592 °F
Flash Point	> 356 °C / > 673 °F
Lower flammability limit	0.07-0.12 oz/ft3
Evaporation rate	No data available
Vapor Pressure	1
Vapor Density	0.4
Specific Gravity	1.75
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Bulk Density	38-45 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids. Strong alkalis.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous	NA	No data available	No data available	No data available

substances in concentrations above cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact Not irritating to skin in rabbits.
Ingestion May cause mild gastric distress.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Dispose in accordance with local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.

New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 11-Dec-2019

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CITRIC ACID

Revision Date: 26-Feb-2018 **Revision Number:** 37

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CITRIC ACID

Other means of Identification

Synonyms None

Hazardous Material Number: HM004421

Recommended use of the chemical and restrictions on use

Recommended Use Scale Remover; pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H319 - Causes serious eye irritation

Precautionary Statements

Prevention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Citric acid	77-92-9

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Citric acid	77-92-9	60 - 100%	Eye Irrit. 2A (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin For skin contact, wipe away excess material with dry towel. Then wash affected areas with plenty of water, and soap if available, for several minutes. Get medical attention if irritation occurs.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool, dry location. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Citric acid	77-92-9	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 0.35 mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	1.8
Freezing Point / Range	No data available
Melting Point / Range	153 °C / 307.4 °F
Boiling Point / Range	Decomposes
Flash Point	345 °C / 653 °F
Upper flammability limit	65
Lower flammability limit	%
Evaporation rate	No data available
Vapor Pressure	0.00000221 Pa
Vapor Density	No data available
Specific Gravity	1.66
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	-1.61 to -1.80
Autoignition Temperature	1010 °C / 1832 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	192.12
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur

10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong alkalis.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes eye irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Citric acid	77-92-9	5400 mg/kg (Rat) 5790 mg/kg (Mouse) 11,700 mg/kg (Rat)	> 2000 mg/kg	No data available

Immediate, delayed and chronic health effects from exposure
Inhalation May cause mild respiratory irritation.
Eye Contact Causes eye irritation.
Skin Contact Not irritating to skin in rabbits.
Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Citric acid	77-92-9	Not irritating to skin in rabbits.

Substances	CAS Number	Serious eye damage/irritation
Citric acid	77-92-9	Causes moderate eye irritation

Substances	CAS Number	Skin Sensitization
Citric acid	77-92-9	Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Citric acid	77-92-9	No information available

Substances	CAS Number	Mutagenic Effects
Citric acid	77-92-9	Did not show mutagenic effects in animal experiments

Substances	CAS Number	Carcinogenic Effects
Citric acid	77-92-9	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity

Citric acid	77-92-9	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Citric acid	77-92-9	No data of sufficient quality are available.

Substances	CAS Number	STOT - repeated exposure
Citric acid	77-92-9	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Citric acid	77-92-9	No adverse health effects are expected from swallowing.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Citric acid	77-92-9	EC50 (72h) 18000 mg/L (Chlorella vulgaris) NOEC (8d) 425 mg/L (cell density) (Scenedesmus quadricauda) LOEC (8d) >80 mg/L (Microcystis aeruginosa)	LC50 (96h) 1516 mg/L (Lepomis macrochirus) LC50 (48h) 440 mg/L (Leuciscus idus melanotus) LC50 (96h) >100 mg/L (Pimephales promelas)	TT (72h) 485 mg/L (Entosiphon sulcatum)	TLM96 100-330 ppm (Crangon crangon) EC50 (24h) 1535 mg/L (Daphnia magna) LC50 (48h) 160 mg/L (Daphnia magna) EC50 (48h) >50 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Citric acid	77-92-9	Readily biodegradable (97% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Citric acid	77-92-9	-1.61 to -1.80

12.4. Mobility in soil

Substances	CAS Number	Mobility
Citric acid	77-92-9	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 26-Feb-2018

Revision Note

SDS sections updated:

2

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
OSHA
ECHA C&L
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BARACARB

Revision Date: 07-Aug-2018 **Revision Number:** 37

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BARACARB

Other means of Identification

Synonyms None

Hazardous Material Number: HM004943

Recommended use of the chemical and restrictions on use

Recommended Use Bridging Agent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Carcinogenicity	Category 1A - H350

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements: H350 - May cause cancer by inhalation

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P281 - Use personal protective equipment as required

Response P308 + P313 - IF exposed or concerned: Get medical advice/attention

Storage P405 - Store locked up

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Crystalline silica, quartz	14808-60-7

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Crystalline silica, quartz	14808-60-7	0.1 - 1%	Carc. 1A (H350) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Not applicable

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Not applicable

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from acids. Store in a cool, dry location. Store locked up. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Crystalline silica, quartz	14808-60-7	TWA: 0.1 mg/m^3	TWA: 0.025 mg/m^3

Appropriate engineering controls
Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an

	industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid Powder	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	8-9
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.7
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	14808-60-7	> 15000 mg/kg (human)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mechanical irritation to eye.

Skin Contact None known.

Ingestion None known.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Exposure Levels

No data available

Interactive effects

Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the eye No information available

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	14808-60-7	No information available.

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	14808-60-7	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	14808-60-7	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	14808-60-7	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	14808-60-7	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	14808-60-7	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	14808-60-7	EC50(72 h)=440 mg/L (Pseudokirchneriella subcapitata)	LL0(96 h)=10000 mg/L (Danio rerio)	No information available	LL50(24 h)>10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	14808-60-7	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Crystalline silica, quartz	14808-60-7	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	14808-60-7	No information available

12.6. Other adverse effects

Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 07-Aug-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CFR-8L

Revision Date: 24-Apr-2018 **Revision Number:** 21

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CFR-8L

Other means of Identification

Synonyms None

Hazardous Material Number: HM005627

Recommended use of the chemical and restrictions on use

Recommended Use Cement Dispersant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician	Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Keep container closed when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally necessary.

Hand Protection Nitrile gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Brown-black
Odor:	Characteristic	**Odor Threshold:**	No information available

Property	Values	Remarks/ - Method
pH:	9 - 11.3	
Freezing Point / Range	-7 °C	
Melting Point / Range	No data available	
Boiling Point / Range	100 °C / 212 °F	
Flash Point	No data available	
Evaporation rate	No data available	
Vapor Pressure	< 18 mmHg	
Vapor Density	No data available	
Specific Gravity	1.17 - 1.2	
Water Solubility	Soluble in water	
Solubility in other solvents	No data available	
Partition coefficient: n-octanol/water	No data available	
Autoignition Temperature	No data available	
Decomposition Temperature	No data available	
Viscosity	No data available	
Explosive Properties	No information available	
Oxidizing Properties	No information available	

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Oxides of sulfur.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact May cause mechanical irritation to eye.

Skin Contact None known.

Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects
No information available
Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	Product contains one or more components not listed on inventory.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	Product contains one or more components not listed on the inventory.
Canadian Domestic Substances List (DSL)	Product contains one or more components not listed on the inventory.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 24-Apr-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SODIUM FLUORESCEIN POWDER

Revision Date: 23-Mar-2017 **Revision Number:** 4

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SODIUM FLUORESCEIN POWDER

Other means of Identification

Synonyms None

Hazardous Material Number: HM007136

Recommended use of the chemical and restrictions on use

Recommended Use Dye

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Sodium fluorescein	518-47-8

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium fluorescein	518-47-8	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from acids. Store in a cool, dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium fluorescein	518-47-8	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties
Physical State: Solid
Color Red-orange
Odor: Odorless
Odor Threshold: No information available

Property	Values	Remarks/ - Method
pH:	No data available	
Freezing Point / Range	No data available	
Melting Point / Range	No data available	
Boiling Point / Range	290 °C / 554 °F	

Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	No data available
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	376.28
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids.
10.6. Hazardous decomposition products
Hydrogen fluoride.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium fluorescein	518-47-8	6721 mg/kg (Rat) 2500 mg/kg (Rabbit) 4738 mg/kg (Mouse)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	May cause mild respiratory irritation.
Eye Contact	May cause mild eye irritation.
Skin Contact	Prolonged or repeated contact may cause slight skin irritation.
Ingestion	May cause damage to bones and teeth.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium fluorescein	518-47-8	Substance may cause slight skin irritation

Substances	CAS Number	Serious eye damage/irritation
Sodium fluorescein	518-47-8	May cause mild eye irritation.

Substances	CAS Number	Skin Sensitization
Sodium fluorescein	518-47-8	No information available

Substances	CAS Number	Respiratory Sensitization
Sodium fluorescein	518-47-8	No information available

Substances	CAS Number	Mutagenic Effects
Sodium fluorescein	518-47-8	In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium fluorescein	518-47-8	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Sodium fluorescein	518-47-8	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Sodium fluorescein	518-47-8	No data of sufficient quality are available.

Substances	CAS Number	STOT - repeated exposure
Sodium fluorescein	518-47-8	No data of sufficient quality are available.

Substances	CAS Number	Aspiration hazard
Sodium fluorescein	518-47-8	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium fluorescein	518-47-8	No information available	LC50 (96h) 997 mg/L (Psetta maxima) LC50 (96h) 1372 mg/L (Oncorhynchus mykiss) LC50 (96h) 2267 mg/L (Ictalurus punctatus) LC50 (96h) 3433 mg/L (Lepomis macrochirus)	No information available	LC50 (48h) 337 mg/L (Daphnia pulex)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium fluorescein	518-47-8	Readily biodegradable (100% @ 20d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow

Sodium fluorescein	518-47-8	Log Kow = -0.67 (estimated)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium fluorescein	518-47-8	KOC = < 2

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 23-Mar-2017

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

PAC™-LV

Revision Date: 17-Feb-2021 **Revision Number:** 6

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name PAC™-LV

Other means of Identification

Synonyms None

Hazardous Material Number: HM007151

Recommended use of the chemical and restrictions on use

Recommended Use Fluid Loss Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
Dust can form an explosive mixture in air
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid creating or inhaling dust. Avoid dust accumulations. Slippery when wet. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a dry location. Product has a shelf life of 36 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White to off white
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6.5-9 (1%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	221 °C / 430 °F
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.6
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	400 °C / 752 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above	NA	No data available	No data available	No data available

cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact Non-irritating to the skin
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability
Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.

New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 17-Feb-2021

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SA-1015

Revision Date: 28-Jan-2020 **Revision Number:** 24

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SA-1015

Other means of Identification

Synonyms None

Hazardous Material Number: HM007221

Recommended use of the chemical and restrictions on use

Recommended Use Suspending Agent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
Dust can form an explosive mixture in air
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures
Inhalation Move person to fresh air.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Scoop up and remove. Do NOT spread spilled product with water.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid dust accumulations. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment. Slippery when wet.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Keep container closed when not in use. Store in a dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Powder
Color White to tan
Odor: Slight
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	7 (1%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 93 °C / > 200 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	No data available
Water Solubility	Forms gel
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	204 °C / 400 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye and skin contact.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous	NA	No data available	No data available	No data available

substances in concentrations above cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact Not irritating to skin in rabbits.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.
Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 28-Jan-2020

Revision Note

SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3

None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SILICALITE-LM

Revision Date: 22-Jan-2020 **Revision Number:** 4

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SILICALITE-LM

Other means of Identification

Synonyms None

Hazardous Material Number: HM008122

Recommended use of the chemical and restrictions on use

Recommended Use Light Weight Cement Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified	
Respiratory Sensitization	Category 1 - H334
Skin Sensitization	Category 1 - H317

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H317 - May cause an allergic skin reaction
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled

Precautionary Statements

Prevention
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P272 - Contaminated work clothing should not be allowed out of the workplace
P280 - Wear protective gloves
P285 - In case of inadequate ventilation wear respiratory protection

Response
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P363 - Wash contaminated clothing before reuse
P304 + P341 - IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing
P342 + P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician

Storage None

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Glutaraldehyde	111-30-8

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Glutaraldehyde	111-30-8	0.1 - 1%	Acute Tox. 3 (H301) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) Resp. Sens. 1 (H334) Skin Sens. 1 (H317) STOT SE 3 (H335) Aquatic Acute 1 (H400) Aquatic Chronic 2 (H411)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Flush skin with large amounts of water. If irritation persists, get medical attention.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

May cause allergic skin reaction. May cause allergic respiratory reaction.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

None known. Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Keep container closed when not in use. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Glutaraldehyde	111-30-8	Not applicable	Ceiling: 0.05 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally necessary.

Hand Protection Impervious gloves Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Dark gray

Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6- 8
Freezing Point / Range	0 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	100 °C / > 212 °F
Evaporation rate	No data available
Vapor Pressure	22.9
Vapor Density	No data available
Specific Gravity	1.37
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

Liquid Density 11.64 lbs/gal

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

None known.

10.6. Hazardous decomposition products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye and skin contact.

Symptoms related to exposure

Most Important Symptoms/Effects

May cause allergic skin reaction. May cause allergic respiratory reaction.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glutaraldehyde	111-30-8	50 mg/kg (Guinea Pig)	560 µL/kg (Rabbit)	0.28-0.5 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation May cause allergic respiratory reaction.
Eye Contact May cause mechanical irritation to eye.
Skin Contact May cause an allergic skin reaction.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Glutaraldehyde	111-30-8	Causes severe skin irritation with tissue destruction. (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Glutaraldehyde	111-30-8	Causes severe eye irritation which may damage tissue. (Rabbit)

Substances	CAS Number	Skin Sensitization
Glutaraldehyde	111-30-8	Skin sensitizer in guinea pig.

Substances	CAS Number	Respiratory Sensitization
Glutaraldehyde	111-30-8	May cause sensitization by inhalation

Substances	CAS Number	Mutagenic Effects
Glutaraldehyde	111-30-8	In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Glutaraldehyde	111-30-8	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Glutaraldehyde	111-30-8	Not a confirmed teratogen or embryotoxin.

Substances	CAS Number	STOT - single exposure

Glutaraldehyde	111-30-8	No information available

Substances	CAS Number	STOT - repeated exposure
Glutaraldehyde	111-30-8	May cause disorder and damage to the Kidney

Substances	CAS Number	Aspiration hazard
Glutaraldehyde	111-30-8	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Glutaraldehyde	111-30-8	EC50(72h): 0.61 mg/L (Desmodesmus subspicatus) EC50(72h): 0.5 mg/L (Skeletonema costatum)	LC50(96h): 10 mg/L (Lepomis macrochirus) NOEC(97d): 1.6 mg/L (Oncorhynchus mykiss) LC50(96h): 3.5 mg/L (Oncorhynchus mykiss) LC50(96h): 60 mg/L (Scophthalmus maximus)	EC50 (17h) 6.65 mg/L (Pseudomonas putida)	EC50(48h): 0.35 mg/L (Daphnia magna) EC50(48h): 0.7 mg/L (Acartia tonsa) NOEC(21d): 0.13 mg/L (Daphnia magna) EC50(48h): 0.1 mg/L (Acartia tonsa)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Glutaraldehyde	111-30-8	Readily biodegradable (75% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Glutaraldehyde	111-30-8	-0.36

12.4. Mobility in soil

Substances	CAS Number	Mobility
Glutaraldehyde	111-30-8	Potential for mobility in soil is high (Koc between 50 and 150). Given its very low Henry'sconstant (3.3E-08 atm*m3/mole; 25 °C Measured), volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 22-Jan-2020

Revision Note

Change to composition
SDS sections updated:
2
3

8
11
15

Full text of H-Statements referred to under sections 2 and 3
H317 - May cause an allergic skin reaction
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

SDS no. D195
Version 5
Revision date 21-Sep-2020
Supersedes Date: 01-Dec-2015

Safety Data Sheet
HP Lite Extender D195

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name HP Lite Extender D195
Product code D195

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid generating or breathing dust. Take up mechanically and collect in suitable container for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Rubber Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	None
Color	Off-white
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble	
Solubility in other solvents	No information available	
Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	None known
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	0.57 - 0.63 g/cm³

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust contact with the eyes can lead to mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation.
Routes of entry	Inhalation.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
The product is insoluble and floats on water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	01-Dec-2015
Revision date	21-Sep-2020
Version	5
This SDS has been revised in the following section(s)	Updated according to GHS/CLP. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	E

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SDS no. PID2179
Version 7
Revision date 22-Oct-2018
Supersedes Date: 05-Sep-2016

Safety Data Sheet
IDCAP* D

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name IDCAP* D
Product code PID2179

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale control agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Polymer

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Polymer	Listed	Proprietary	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Avoid dust formation. Material becomes slippery when wet. Use caution if wet. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Oxidizing agents Protect from moisture

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Polymer	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Polymer	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Polymer	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Polymer	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Polymer	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Granules Dust
Odor	Mild
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	6.0 ± 1.00	@ 1%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.40 - 1.55	@ 68°F / 20 °C
Bulk density	750 kg/m³	

Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	Soluble
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid contact with heat, sparks, open flame, and static discharge. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
Eye contact	Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation. Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polymer	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polymer	No information available	No information available	No information available

12.2 Persistence and degradability

Product is not biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies

Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	05-Sep-2016
Revision date	22-Oct-2018
Version	7
This SDS has been revised in the following section(s)	2, 6, 7, 8, 9, 10, 11, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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NEWPARK DRILLING FLUIDS

SAFETY DATA SHEET

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 Product identifier

Product name **IDCIDE-20**

Synonyms IDCIDE 20

1.2 Uses and uses advised against

Uses BIOCIDE ● DRILLING FLUID ADDITIVE ● WATER TREATMENT

1.3 Details of the supplier of the product

Supplier name **NEWPARK DRILLING FLUIDS (AUSTRALIA) LTD**

Address 11 Alacrity Place, Henderson, WA, 6166, AUSTRALIA

Telephone +61 8 9410 8200

Fax +61 8 9410 8299

Website www.newpark.com

1.4 Emergency telephone numbers

Emergency 1800 127 406 (Australia); +64 4 917 9888 (International)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

Physical Hazards

Not classified as a Physical Hazard

Health Hazards

Acute Toxicity: Oral: Category 4
Skin Corrosion/Irritation: Category 2
Skin Sensitisation: Category 1
Serious Eye Damage / Eye Irritation: Category 2A

Environmental Hazards

Not classified as an Environmental Hazard

2.2 GHS Label elements

Signal word **WARNING**

Pictograms

Hazard statements

H302	Harmful if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.

Prevention statements

P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P264	Wash thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Response statements

P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P321	Specific treatment is advised - see first aid instructions.
P330	Rinse mouth.
P333 + P313	If skin irritation or rash occurs: Get medical advice/attention.
P362	Take off contaminated clothing and wash before re-use.

Storage statements

None allocated.

Disposal statements

P501	Dispose of contents/container in accordance with relevant regulations.

2.3 Other hazards

No information provided.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

3.1 Substances / Mixtures

Ingredient	CAS Number	EC Number	Content
TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE(2:1)	55566-30-8	259-709-0	18 to 25%
WATER	7732-18-5	231-791-2	Remainder

4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes.

Inhalation If inhaled, remove from contaminated area. To protect rescuer, use a Type A (Organic vapour) respirator or an Air-line respirator (in poorly ventilated areas). Apply artificial respiration if not breathing.

Skin If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Continue flushing with water until advised to stop by a Poisons Information Centre or a doctor.

Ingestion For advice, contact a Poisons Information Centre on 13 11 26 (Australia Wide) or a doctor (at once).

First aid facilities Eye wash facilities should be available.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

4.3 Immediate medical attention and special treatment needed

Treat symptomatically.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Use an extinguishing agent suitable for the surrounding fire.

5.2 Special hazards arising from the substance or mixture

Non flammable. May evolve carbon oxides and hydrocarbons when heated to decomposition. May evolve carbon oxides, sulphur oxides and phosphates when heated to decomposition.

5.3 Advice for firefighters

Treat as per requirements for surrounding fires. Evacuate area and contact emergency services. Remain upwind and notify those downwind of hazard. Wear full protective equipment including Self Contained Breathing Apparatus (SCBA) when combating fire. Use waterfog to cool intact containers and nearby storage areas.

5.4 Hazchem code

None allocated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS. Clear area of all unprotected personnel. Ventilate area where possible. Contact emergency services where appropriate.

6.2 Environmental precautions

Prevent product from entering drains and waterways.

6.3 Methods of cleaning up

Contain spillage, then cover / absorb spill with non-combustible absorbent material (vermiculite, sand, or similar), collect and place in suitable containers for disposal.

6.4 Reference to other sections

See Sections 8 and 13 for exposure controls and disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, dry, well ventilated area, removed from incompatible substances, heat or ignition sources and foodstuffs. Ensure containers are adequately labelled, protected from physical damage and sealed when not in use. Large storage areas should have appropriate ventilation systems.

7.3 Specific end uses

No information provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Exposure standards

No exposure standards have been entered for this product.

Biological limits

No biological limit values have been entered for this product.

8.2 Exposure controls

Engineering controls Avoid inhalation. Use in well ventilated areas. Where an inhalation risk exists, mechanical extraction ventilation is recommended.

PPE

Eye / Face	Wear splash-proof goggles.
Hands	Wear PVC or rubber gloves.
Body	Wear coveralls. In a laboratory situation, wear a laboratory coat.
Respiratory	Where an inhalation risk exists, wear a Type A (Organic vapour) respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	COLOURLESS TO PALE YELLOW LIQUID
Odour	SLIGHT ODOUR
Flammability	NON FLAMMABLE
Flash point	NOT RELEVANT
Boiling point	> 100°C
Melting point	< 0°C
Evaporation rate	AS FOR WATER
pH	3.0 to 3.5
Vapour density	NOT AVAILABLE
Specific gravity	1.08
Solubility (water)	SOLUBLE
Vapour pressure	18 mm Hg @ 20°C
Upper explosion limit	NOT RELEVANT
Lower explosion limit	NOT RELEVANT
Partition coefficient	NOT AVAILABLE
Autoignition temperature	NOT AVAILABLE
Decomposition temperature	NOT AVAILABLE
Viscosity	NOT AVAILABLE
Explosive properties	NOT AVAILABLE
Oxidising properties	NOT AVAILABLE
Odour threshold	NOT AVAILABLE

9.2 Other information

% Volatiles	> 60 % (Water)

10. STABILITY AND REACTIVITY

10.1 Reactivity

Carefully review all information provided in sections 10.2 to 10.6.

10.2 Chemical stability

Stable under recommended conditions of storage.

10.3 Possibility of hazardous reactions

Polymerization is not expected to occur.

10.4 Conditions to avoid

Avoid heat, sparks, open flames and other ignition sources.

10.5 Incompatible materials

Incompatible with oxidising agents (e.g. hypochlorites), acids (e.g. nitric acid), heat and ignition sources.

10.6 Hazardous decomposition products

May evolve carbon oxides and hydrocarbons when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity Harmful if swallowed.

Information available for the ingredients:

Ingredient	Oral LD50	Dermal LD50	Inhalation LC50
TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE(2:1)	248 mg/kg (rat)	> 2000 mg/kg (rat)	5.5 mg/L/4hrs (rat)

Additional ingredient toxicity values:

TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE(2:1) (55566-30-8)

TDLo (oral) 650 mg/kg/13 weeks - intermittent (rat)

Skin Contact may result in irritation, redness, pain and rash.

Eye	Contact may result in irritation, lacrimation, pain and redness.
Sensitisation	May cause an allergic skin reaction. This product is not classified as a respiratory sensitiser.
Mutagenicity	Not classified as a mutagen.
Carcinogenicity	Not classified as a carcinogen.
Reproductive	Not classified as a reproductive toxin.
STOT - single exposure	Over exposure may result in respiratory irritation, nausea, dizziness, drowsiness and headache.
STOT - repeated exposure	Not classified as causing organ damage from repeated exposure.
Aspiration	Not classified as causing aspiration.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

75% TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE (55566-30-8):
LC50 (Rainbow Trout) = 119 mg/L/96 hr
LC50(Bluegill Sunfish) = 93 mg/L/ 96 hr
EC50 (Daphnia Magna) = 19 mg/L/48 hr
LC50 (Brown Shrimp) = 340 mg/L/96 hr
LC50 (Mysid Shrimp) = 9.5 mg/L/96 hr
LC50 (Sheepshead Minnow) = 94 mg/L/96 hr
LC50 (Jevenile Plaice) = 86 mg/L/96 hr

Waste Water management
EC50 (Activated Sludge) = 24 mg/L/3 hr

12.2 Persistence and degradability

This product is readily biodegradable.

12.3 Bioaccumulative potential

No information provided.

12.4 Mobility in soil

No information provided.

12.5 Other adverse effects

No information provided.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste disposal For small amounts, absorb with sand, vermiculite or similar and dispose of to an approved landfill site. For large quantities, contact the manufacturer/supplier for additional information. Prevent contamination of drains and waterways as aquatic life may be threatened and environmental damage may result.

Legislation Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None allocated.	None allocated.	None allocated.
14.2 Proper Shipping Name	None allocated.	None allocated.	None allocated.
14.3 Transport hazard class	None allocated.	None allocated.	None allocated.
14.4 Packing Group	None allocated.	None allocated.	None allocated.

14.5 Environmental hazards

No information provided.

14.6 Special precautions for user

Hazchem code None allocated.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Classifications Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

Inventory listings **AUSTRALIA: AICS (Australian Inventory of Chemical Substances)**
All components are listed on AICS, or are exempt.

16. OTHER INFORMATION

Additional information

RESPIRATORS: In general the use of respirators should be limited and engineering controls employed to avoid exposure. If respiratory equipment must be worn ensure correct respirator selection and training is undertaken. Remember that some respirators may be extremely uncomfortable when used for long periods. The use of air powered or air supplied respirators should be considered where prolonged or repeated use is necessary.

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as form of product, method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: form of product; frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
GHS	Globally Harmonized System
GTEPG	Group Text Emergency Procedure Guide
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m³	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

Prepared by

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[End of SDS]

SDS no. 141788
Version 3
Revision date 11-Feb-2020
Supersedes Date: 02-Sep-2016

Safety Data Sheet
KCl BRINE w/GLYDRIL MC

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KCl BRINE w/GLYDRIL MC
Product code 141788

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale inhibitor.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	500-012-0	9004-77-7	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Chlorides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Strong acids Strong alkalies.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard

present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Mild
Color	Clear
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	7 - 9	Conc.solution
pH @ dilution	No information available	
Melting / freezing point	-10 °C / 14 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	

Vapor density	No information available	
Specific gravity	1.12 - 1.15	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong alkalies.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	2630 mg/kg (Rat)	3540 mg/kg bw (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates

Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	LC50 >1800 mg/l, 96h Scophthalmus maximus OECD 203	EC50: 2490 mg/l, 72h Selenastrum capricornutum OECD 201	EC50 >3200 mg/l, 48h Daphnia magna OECD 202

12.2 Persistence and degradability

Product is biodegradable. See component information below.

Chemical Name	Persistence and degradability
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	OECD 301D 76%

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	log Kow 0.44@20°C

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-Sep-2016
Revision date	11-Feb-2020
Version	3
This SDS has been revised in the following section(s)	3, 8, 11, 12, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
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SDS no. 142053
Version 2
Revision date 22-Feb-2017
Supersedes Date: 03-Oct-2012

Safety Data Sheet
KCl/NaBr BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KCl/NaBr BRINE
Product code 142053
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion brine.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

–

Contains
Sodium bromide

Potassium Chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium bromide	Not applicable	7647-15-6	30-60
Potassium Chloride	231-211-8	7447-40-7	5-10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Bromine, bromine oxides and hydrogen bromide, Chlorides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium bromide	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium bromide	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium bromide	Not determined	Not determined	Not determined
Potassium Chloride	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium bromide	Not determined	Not determined	3 mg/m³ MAC

Potassium Chloride	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium bromide	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Butyl Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	~ 7	
Melting / freezing point	No information available	

Boiling point/range	> 100 °C / > 212 °F
Flash point	No information available
Evaporation rate (BuAc =1)	No information available
Flammability (solid, gas)	Not applicable
Flammability Limit in Air	
Upper flammability limit	Not applicable
Lower flammability limit	Not applicable
Vapor pressure	No information available
Vapor density	No information available
Specific gravity	No information available
Bulk density	No information available
Relative density	1.30 - 1.44 s.g
Water solubility	Miscible with water.
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium bromide	= 3500 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	No data available
Potassium Chloride	= 2600 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium bromide	> 1000 mg/L LC50 Oncorhynchus mykiss 96 h 0.054 - 0.081 mg/L LC50 Oncorhynchus mykiss 96 h > 1000 mg/L LC50 Lepomis macrochirus 96 h 15614 - 17428 mg/L LC50 Pimephales promelas 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h 16000 - 24000 mg/L LC50 Poecilia reticulata 96 h = 24000 mg/L LC50 Oryzias latipes 96 h 24000 - 96000 mg/L LC50 Oryzias latipes 96 h	5800 - 24000 mg/L EC50 Scenedesmus pannonicus 96 h	5700 - 10800 mg/L EC50 Daphnia magna 48 h 5800 - 48000 mg/L EC50 Daphnia magna 48 h
Potassium Chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium bromide
Schedule 4
Potassium Chloride
Schedule 4

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	03-Oct-2012
Revision date	22-Feb-2017
Version	2
This SDS has been revised in the following section(s)	This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

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SDS no. PID16782
Version 4
Revision date 20-Jun-2019
Supersedes Date: 08-Dec-2015

Safety Data Sheet
KCL/POLYMER SYSTEM

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KCL/POLYMER SYSTEM
Product code PID16782

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Barite

Potassium Chloride

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Barite	236-664-5	13462-86-7	60-100
Potassium Chloride	231-211-8	7447-40-7	10-30
Crystalline silica (impurity)	238-878-4	14808-60-7	1-5

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

The product contains other ingredients which do not contribute to the overall classification.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth

to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Barite	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**

Barite	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Barite	6 mg/m³ MAC	Not determined	Not determined
Potassium Chloride	5 mg/m³ MAC	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Barite	Not determined	Not determined	6 mg/m³ TWA Fibrogenic substance 0242
Potassium Chloride	Not determined	Not determined	5 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Barite	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC Butyl
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P3. At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Mild
Color	Light brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	7 - 11	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.1 - 2.0	@ 20°C.
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization

Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barite	> 15000 mg/kg (Rat)	No data available	No data available
Potassium Chloride	= 2600 mg/kg (Rat)	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Barite	No information available	No information available	No information available
Potassium Chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Barite	Inorganic compound
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Barite	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility

The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Barite	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Barite	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Potassium Chloride
Schedule 4

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 08-Dec-2015

Revision date	20-Jun-2019
Version	4
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID857
Version 6
Revision date 09-Nov-2018
Supersedes Date: 14-Nov-2017

Safety Data Sheet
KLA-GARD*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KLA-GARD*
Product code PID857

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale control agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Ammonia.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Ammonia or amines may be released when this component is heated or exposed to high pH.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Oxidizing agents Acids Bases
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Contains no substances with occupational exposure limit values No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Repeated or prolonged contact Impervious gloves made of: Nitrile Neoprene Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient

	ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Chemical respirator with ammonia and amines cartridge (K/P2, green filter). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Local authorities should be advised if significant spillages cannot be contained See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Amine
Color	Clear - Blue
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	6.5 - 8.5	(1% solution)
Melting / freezing point	No information available	
Boiling point/range	125 °C / 257 °F	
Flash point	> 99 °C / > 210 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.1 sg	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Ammonia or amines may be released when this component is heated or exposed to high pH.

10.5 Incompatible materials

Oxidizing agents. Acids. Bases.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Readily biodegradable. (ECHA data) (PRODUCT).

12.3 Bioaccumulative potential

Bioaccumulation is unlikely. (ECHA data) (PRODUCT).

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 14-Nov-2017

Revision date 09-Nov-2018

Version	6
This SDS has been revised in the following section(s)	2, 6, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID17728
Version 4
Revision date 20-Jul-2018
Supersedes Date: 02-Apr-2016

Safety Data Sheet
KLA-HIB*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KLA-HIB*
Product code PID17728

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale inhibitor.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Dermal	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P330 - Rinse mouth
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P363 - Wash contaminated clothing before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*

Hydrochloric acid

Hexane-1,6-diamine

Cyclohex-1,2-ylenediamine

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	907-605-7	RM1003118	10-30
Hydrochloric acid	231-595-7	7647-01-0	10-30
Hexane-1,6-diamine	204-679-6	124-09-4	10-30
Cyclohex-1,2-ylenediamine	211-776-7	694-83-7	5-10

Comments
Hydrochloric acid added for pH adjustment.

H314 does not apply as studies have been performed confirming this substance is an Irritant and not Corrosive to Skin.

The product contains other ingredients which do not contribute to the overall classification.

*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention at once.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek immediate medical attention/advice.

Eye Contact — Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Seek medical attention at once.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not breathe vapors or spray mist. Use personal protective equipment. Do not get on skin or clothing. Wash thoroughly after handling. See also section 8.

6.2 Environmental precautions

Do not allow material to contaminate ground water system.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Isocyanates Aldehydes Ketones Anhydrides. Phenols Nitrates Acids Halogenated compounds

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Hydrochloric acid	Not determined	Not determined	Not determined
Hexane-1,6-diamine	0.5 ppm TWA 2.3 mg/m³ TWA	Not determined	Not determined
Cyclohex-1,2-ylenediamine	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Hydrochloric acid	5 ppm Ceiling 7 mg/m³ Ceiling	2 ppm Ceiling	Not determined
Hexane-1,6-diamine	Not determined	0.5 ppm TWA	Not determined
Cyclohex-1,2-ylenediamine	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Reaction mass of	Not determined	Not determined	Not determined

7-azatridecane-1,13-diamine and hexamethylenediamine*			
Hydrochloric acid	5 mg/m³ MAC	7.5 mg/m³ STEL 5.0 ppm STEL	5 ppm Ceiling 7.5 mg/m³ Ceiling
Hexane-1,6-diamine	0.1 mg/m³ MAC	Not determined	Not determined
Cyclohex-1,2-ylenediamine	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Hydrochloric acid	5 ppm Ceiling 7.5 mg/m³ Ceiling	Not determined	Acute dangerous substance 5 mg/m³ MAC
Hexane-1,6-diamine	0.5 ppm TWA 2.3 mg/m³ TWA	Not determined	0.1 mg/m³ MAC Allergenic substance
Cyclohex-1,2-ylenediamine	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Hydrochloric acid	Not determined	5 mg/m³ TWA 7.5 mg/m³ STEL	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA 8 mg/m³ TWA
Hexane-1,6-diamine	Not determined	Not determined	Not determined
Cyclohex-1,2-ylenediamine	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Neoprene Rubber PVC
Break through time >480 minutes
Glove thickness 0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Pungent
Color	Dark brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	9-11	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	~ 100 °C / 212 °F	
Flash point	> 100 °C / > 212 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.0 - 1.10	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents. Isocyanates. Aldehydes. Ketones. Anhydrides. Phenols. Nitrates. Acids. Halogenated compounds.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information Skin corrision: Not corrosive. - By analogy to product with similar composition.

Inhalation May cause respiratory irritation.

Eye contact Causes serious eye damage.

Skin contact Harmful in contact with skin. Causes skin irritation. May cause an allergic skin reaction. Components of the product may be absorbed into the body through the skin.

Ingestion Harmful if swallowed.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	No data available	No data available	No data available
Hydrochloric acid	238 - 277 mg/kg (Rat)	> 5010 mg/kg (Rabbit)	= 1.68 mg/L (Rat) 1 h
Hexane-1,6-diamine	= 750 mg/kg (Rat)	= 1110 mg/kg (Rabbit)	No data available
Cyclohex-1,2-ylenediamine	= 4556 mg/kg (Rat)	No data available	> 3.23 mg/L (Rat) 4 h

Sensitization May cause sensitization by skin contact.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Ingestion. Eye contact. Skin contact. Inhalation.

Routes of entry	Ingestion. Eye contact. Skin contact. Inhalation.
Specific target organ toxicity - Single exposure	Category 3
Specific target organ toxicity - Repeated exposure	Not classified.
Target organ effects	Respiratory system. Lungs.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	No information available	No information available	No information available
Hydrochloric acid	= 282 mg/L LC50 Gambusia affinis 96 h	No information available	No information available
Hexane-1,6-diamine	= 62 mg/L LC50 Leuciscus idus 96 h = 1825 mg/L LC50 Pimephales promelas 96 h > 56 mg/L LC50 Lepomis macrochirus 96 h	= 14.8 mg/L EC50 Pseudokirchneriella subcapitata 96 h = 15 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 23.4 mg/L EC50 Daphnia magna 48 h
Cyclohex-1,2-ylenediamine	No information available	No information available	No information available

12.2 Persistence and degradability

Product is biodegradable.

Chemical Name	Persistence and degradability
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Readily biodegradable
Hydrochloric acid	Readily biodegradable
Hexane-1,6-diamine	Readily biodegradable
Cyclohex-1,2-ylenediamine	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate.

Chemical Name	Bioaccumulation
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	No information available
Hydrochloric acid	Does not bioaccumulate
Hexane-1,6-diamine	Does not bioaccumulate
Cyclohex-1,2-ylenediamine	No information available

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Easily soluble
Hydrochloric acid	Soluble in water
Hexane-1,6-diamine	Easily soluble
Cyclohex-1,2-ylenediamine	Soluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	No information available
Hydrochloric acid	Not expected to adsorb on soil
Hexane-1,6-diamine	Not expected to adsorb on soil
Cyclohex-1,2-ylenediamine	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

This product was tested in accordance with the IATA Dangerous Goods Classification Procedures, Test Method for Corrosive Substances. The test results has determined that this product is not Corrosive.

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Hydrochloric acid
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Does not comply
Canada (DSL)	Complies Does not comply
Philippines (PICCS)	Does not comply

Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

CAS Number 68411-90-5 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	02-Apr-2016
Revision date	20-Jul-2018
Version	4
This SDS has been revised in the following section(s)	1, 2, 7, 8, 11, 12, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	J

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SDS no. SYS00015
Version 2
Revision date 27-Mar-2019
Supersedes Date: 04-Aug-2016

Safety Data Sheet
KLA-SHIELD* PREMIX

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KLA-SHIELD* PREMIX
Product code SYS00015
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Pre-mix for Drilling Fluid. Water based.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H318 - Causes serious eye damage

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse

Contains
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	-	9046-10-0	< 3

Comments
The product contains other ingredients which do not contribute to the overall classification.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the

drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits

Contains no substances with occupational exposure limit values
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	No information available
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	10	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	2885 mg/kg (Rat) OECD 401	2979 mg/kg (Rabbit) OECD 402	> 0.74 mg/l (Rat) OECD 403

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure	Skin contact. Eye contact.
Routes of entry	None known.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	LC50 >700 mg/l 96h	EC50 >700 mg/l 72h	EC50 >1001 mg/l 48h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Does not bioaccumulate

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code.
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	04-Aug-2016
Revision date	27-Mar-2019

Version	2
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID16312
Version 5
Revision date 21-Jan-2019
Supersedes Date: 18-Dec-2015

Safety Data Sheet
KLA-SHIELD* SYSTEM

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KLA-SHIELD* SYSTEM
Product code PID16312

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium Chloride

Crystalline silica (impurity)

Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium Chloride	231-598-3	7647-14-5	10-30
Crystalline silica (impurity)	238-878-4	14808-60-7	<1
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	907-605-7	RM1003118	<1

Comments
*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation

develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits
Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium Chloride	5 mg/m³ MAC	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium Chloride	Not determined	Not determined	5 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Butyl
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Amine
Color	Light brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	10-11	Conc.solution
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	17 - 23.8 mbar	@ 20 °C
Vapor density	No information available	
Specific gravity	1.1 - 2.0	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Inhalation Vapors may irritate throat and respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium Chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available
Reaction mass of 7-azatridecane-1,13-diamine	No data available	No data available	No data available

and hexamethylenediamine*			

Sensitization Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium Chloride	= 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h 4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h
Reaction mass of 7-azatridecane-1,13-diamine and	No information available	No information available	No information available

hexamethylenediamine*			

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Readily biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	No information available

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	Easily soluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil
Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine*	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code.

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances

[NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

CAS Number 68411-90-5 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	18-Dec-2015
Revision date	21-Jan-2019
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID12074
Version 9
Revision date 21-Feb-2019
Supersedes Date: 08-Feb-2019

Safety Data Sheet
KLA-STOP*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KLA-STOP*
Product code PID12074

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale inhibitor.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1C
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse

Contains
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of toxic and corrosive gases/vapors

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	-	9046-10-0	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Rinse mouth. Never give anything by mouth to an unconscious person. Get immediate medical attention.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention at once.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
High volume water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Keep people away from and upwind of spill/leak. Do not get on skin or clothing. Wash thoroughly after handling. Avoid contact with eyes. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong acids
Storage class	Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes
Chemical splash goggles and/or face shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene Rubber
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Ammoniacal
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	9.2 - 10.2	@ 5%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	> 93 °C / > 200 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.03 - 1.075	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	80 - 120 cP	@ 24 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition.

10.5 Incompatible materials

Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapors may irritate throat and respiratory system. Inhaled corrosive substances can lead to a toxic edema of the lungs.

Eye contact Causes burns. May cause irreversible damage to eyes.

Skin contact Causes severe skin burns.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	2885 mg/kg (Rat) OECD 401	2979 mg/kg (Rabbit) OECD 402	> 0.74 mg/l (Rat) OECD 403

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Eye contact. Inhalation.
Routes of entry	Skin contact. Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	LC50 >700 mg/l 96h	EC50 >700 mg/l 72h	EC50 >1001 mg/l 48h

12.2 Persistence and degradability

Product is not biodegradable. See component information below.

Chemical Name	Persistence and degradability
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Does not bioaccumulate

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN2735
UN No. (IMDG/ANTAQ) UN2735
UN No. (ICAO/ANAC) UN2735

14.2. UN proper shipping name

AMINES, LIQUID, CORROSIVE, N.O.S. (contains Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups)

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class 8

IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	III
IMDG/ANTAQ Packing group	III
ICAO/ANAC Packing group	III

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2X
Tunnel restriction code	(E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002491
Group number	8.3A, 8.2C

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	08-Feb-2019
Revision date	21-Feb-2019
Version	9
This SDS has been revised in the following section(s)	1, 2, 3, 5, 7, 8, 10, 11, 12, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID859
Version 5
Revision date 14-Nov-2019
Supersedes Date: 01-Aug-2016

Safety Data Sheet
KLEEN UP*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name KLEEN UP*
Product code PID859

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Detergent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Alcohols, C11-14-iso-, C13-rich, ethoxylated

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Alcohols, C11-14-iso-, C13-rich, ethoxylated	polymer	78330-21-9	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Seek medical attention at once.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store at room temperature Do not freeze Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Alcohols, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Alcohols, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**

Alcohols, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Alcohols, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Alcohols, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance No information available
Odor Slight
Color Off-white
Odor threshold Not applicable

Property	Values	Remarks
pH	7.0 - 8.5	ASTM E70 (as supplied)
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	~ 100 °C / ~ 212 °F	
Flash point	> 100 °C / > 212 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	~ 1.02	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	</= 0°C
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Store at room temperature. Do not freeze.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

LD50 Oral > 2000 mg/kg (rat) (based on components) (MIXTURE)

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alcohols, C11-14-iso-, C13-rich, ethoxylated	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that

large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Alcohols, C11-14-iso-, C13-rich, ethoxylated	No information available	No information available	No information available

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002503
Group number	8.3A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances

[NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	01-Aug-2016
Revision date	14-Nov-2019
Version	5
This SDS has been revised in the following section(s)	2, 3, 7, 8, 11, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D188S
Version 1
Revision date 20-Mar-2019
Supersedes Date: None

Safety Data Sheet
Light Weight Extender D188S

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Light Weight Extender D188S
Product code D188S

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Silicon Dioxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Silicon Dioxide	231-545-4	7631-86-9	<=3

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
None known

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Contaminated surfaces will be extremely slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Component Information

Chemical Name	Arabic	Australia	Egypt
Silicon Dioxide	Not determined	2mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Silicon Dioxide	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Silicon Dioxide	1 mg/m³ MAC 2 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Silicon Dioxide	Not determined	Not determined	3 mg/m³ STEL 6 mg/m³ STEL 1 mg/m³ TWA 2 mg/m³ TWA Fibrogenic substance in the form of condensation aerosol containing it >60% 1121, 1122 Fibrogenic substance also vitreous, in the form of disintegration aerosol 1123
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Silicon Dioxide	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.38 - 0.42	
Bulk density	No information available	
Relative density	0.97-1.01 kg/cm3	@ 20°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	

Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Silicon Dioxide	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 2.2 mg/L (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact. Inhalation. Ingestion.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Silicon Dioxide	= 5000 mg/L LC50 Brachydanio rerio 96 h	= 440 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 7600 mg/L EC50 Ceriodaphnia dubia 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
The product is insoluble and floats on water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated

ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel

Revision date	20-Mar-2019
Version	1
This SDS has been revised in the following section(s)	New issue. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	E

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SDS no. D077
Version 4
Revision date 08-Feb-2021
Supersedes Date: 07-Mar-2019

Safety Data Sheet
Liquid Accelerator D77

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Liquid Accelerator D77
Product code D077

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

–

Contains
Calcium chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium chloride	233-140-8	10043-52-4	30 - 60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Chlorine, chlorine oxides, hydrogen chloride.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Strong reducing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium chloride	Not determined	Not determined	2 mg/m³ MAC (aerosol)

Chemical Name	Thailand	Vietnam	Turkey
Calcium chloride	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Neoprene Nitrile rubber
Break through time >480 minutes
Glove thickness 0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type B/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Odorless
Color	Colorless

Property	Values	Remarks
pH	6.5 - 7.5	
pH @ dilution	No information available	

Melting / freezing point	-14 °C / 7 °F	
Boiling point/range	> 100 °C / >212 °F	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	Not applicable	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	9 mmHg	@ 20 °C
Relative Vapor Density	No information available	
Specific gravity	1.01 - 1.41	@ 20 °C
Bulk density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	
Explosive properties	Not applicable	
Oxidizing properties	None known.	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None known.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Oxidizing agents. Strong reducing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium chloride	= 1000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact.

Routes of entry Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Neurological effects None known.

Target organ effects None known.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae

This product is not considered toxic to algae.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium chloride	= 10650 mg/L LC50 Lepomis macrochirus 96 h	No information available	2,400 mg/L EC50 (Daphnia magna) = 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium chloride	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium chloride	Inorganic compound

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
Calcium chloride	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium chloride	After release, disperses through ground water

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Proper Shipping Name : Calcium Chloride Solution (less than 35%) Ship Type:- 3. Pollution Category:- Z.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Classified

HSNO approval no. Calcium Chloride - HSR003389
Calcium chloride, >25% in a non hazardous diluent - HSR006565

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code) with amendments.MARPOL 73/78; Marine Environmental Protection Committee (MEPC) Circulars.

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	07-Mar-2019
Revision date	08-Feb-2021
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	B

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SDS no. D162
Version 4
Revision date 24-May-2021
Supersedes Date: 25-Aug-2015

Safety Data Sheet
Liquid Anti-Settling Agent D162

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Liquid Anti-Settling Agent D162
Product code D162

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards

Flammable Liquids	Category 4

2.2 Label elements

Signal word

WARNING

Hazard Statements
H227 - Combustible liquid

Precautionary statements
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

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Contains
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Distillates, petroleum, hydrotreated light	265-149-8	64742-47-8	60-100

Comments
The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
P378 - Use dry sand, dry chemical or alcohol-resistant foam for extinction.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
combustible liquid. Vapors are heavier than air and may spread along floors. Vapors may form explosive mixture with air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Harmful organic chemical fumes.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid contact with heat, sparks, open flame, and static discharge. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water. Take precautionary measures against static discharges. Ground and bond containers when transferring material.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m^3 and ST. EXP = 10mg/m^3.

Component Information

Chemical Name	Arabic	Australia	Egypt
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl rubber Nitrile Break through time >480 minutes Glove thickness 0.38 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No protective equipment is needed under normal use conditions In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Solution
Odor	Slight Petroleum solvent
Color	Amber

Property	**Values**	**Remarks**
pH	7	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	208 °C / 406 °F	

Flash point	77 °C / 171 °F	ASTM D 93
Evaporation rate (BuAc =1)	No information available	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	No information available	
Relative Vapor Density	No information available	
Specific gravity	0.87	
Bulk density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	> 20.5 mm2/s	@ 40 °C
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Combustible liquid.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	>5000 mg/kg (Rat)	No data available	>5000 mg/m³ (Rat, 8h) >5000 mg/kg (Rabbit)

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available	1000 mg/l (Oncorhynchus mykiss, 96h	1000 mg/l (Daphnia magna), 48h

12.2 Persistence and degradability

Product is biodegradable.

Chemical Name	Persistence and degradability
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Readily biodegradable

12.3 Bioaccumulative potential

No product level data available.

Chemical Name	Bioaccumulation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Does not bioaccumulate

12.4 Mobility

Mobility
Slightly soluble in water. See component information below.

Chemical Name	Mobility
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors. Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Additives, Process Chemicals and Raw Materials (Combustible) Group Standard 2020

HSNO approval no. HSR002490

Group number 3.1D

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies

Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	25-Aug-2015
Revision date	24-May-2021
Version	4
This SDS has been revised in the following section(s)	This SDS has been made in a new database and therefore a new layout. There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	2
Physical hazard	0
PPE	X

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SDS no. D081
Version 4
Revision date 12-May-2020
Supersedes Date: 27-Mar-2018

Safety Data Sheet
Liquid Retarder D81

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Liquid Retarder D81
Product code D081

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Store away from incompatibles, Strong acids Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Break through time >480 minutes Glove thickness >0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing

before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Of burnt sugar / Slight
Color	Dark brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	3.5 - 5.1	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	No information available	
Specific gravity	1.24 - 1.26	@ 27 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	400 °C / 752 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	350 mPa.s	@ 20 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from direct sunlight.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Eye contact. Inhalation.
Routes of entry	No route of entry noted.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	27-Mar-2018
Revision date	12-May-2020
Version	4
This SDS has been revised in the following section(s)	9, 12, No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information

National occupational exposure limits

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SDS no. D194
Version 3
Revision date 12-Feb-2019
Supersedes Date: 03-Jun-2015

Safety Data Sheet
Liquid Trifunctional Additive D194

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Liquid Trifunctional Additive D194
Product code D194

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Break through time >480 minutes Glove thickness >0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Mild
Color	Brown
Odor threshold	No information available

Property	**Values**	**Remarks**
pH	10	
pH @ dilution	No information available	
Melting / freezing point	-2 °C / 28.4 °F	
Boiling point/range	104 °C / 219.2 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	14.2 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	1.30	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	<600 cst	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Inhalation. Ingestion. Eye contact.
Routes of entry	Ingestion. Inhalation.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	03-Jun-2015
Revision date	12-Feb-2019
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D124
Version 4
Revision date 24-Jul-2019
Supersedes Date: 05-Jun-2015

Safety Data Sheet
LITEFIL* D124 Extender

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name LITEFIL* D124 Extender
Product code D124

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Ashes (residues), cenospheres

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Ashes (residues), cenospheres	Listed	Proprietary	60-30

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
None known

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Contaminated surfaces will be extremely slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Extremely slippery when spilled.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Hydrofluoric acid (HF)

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established.

Component Information

Chemical Name	Arabic	Australia	Egypt
Ashes (residues), cenospheres	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Ashes (residues), cenospheres	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ashes (residues), cenospheres	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ashes (residues), cenospheres	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ashes (residues), cenospheres	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment
Eye protection Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields
Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Neoprene Nitrile Rubber Frequent change is advisable

Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Ceramic Microspheres
Odor	Earthy
Color	Gray White Off-white Brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	1200-1400 °C / 2192-2552 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	384 kg/m³	
Relative density	0.60 - 0.85 g/cc	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

Hydrofluoric acid (HF).

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ashes (residues), cenospheres	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Inhalation. Ingestion. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ashes (residues), cenospheres	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility

The product is insoluble and floats on water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not applicable

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ashes (residues), cenospheres
Schedule 4
Schedule 6
Schedule 5

HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Does not comply
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel

Supersedes Date:	05-Jun-2015
Revision date	24-Jul-2019
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D097
Version 5
Revision date 15-Jul-2021
Supersedes Date: 30-Sep-2015

Safety Data Sheet
Losseal* W / O D097

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Losseal* W / O D097
Product code D097

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

_

Contains
Mica

Glass fibers

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Mica	601-648-2	12001-26-2	30-60
Glass fibers	262-373-8	60676-86-0	10-30
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep

powder dry.

Methods for cleaning up
Avoid generating or breathing dust. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not breathe dust. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Mica	3 mg/m³ TWA	2.5mg/m³TWAinspirable	Not determined
Glass fibers	0.1 mg/m³ TWA	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Mica	Not determined	3 mg/m³ TWA	Not determined
Glass fibers	Not determined	0.1 mg/m³ TWA	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Mica	2 mg/m³ MAC	Not determined	3 mg/m³ TWA
Glass fibers	1 mg/m³ MAC	Not determined	0.2 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Mica	3 mg/m³ TWA	Not determined	6 mg/m³ STEL 0.5 mg/m³ TWA Fibrogenic substance 1179
Glass fibers	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance in the form of disintegration aerosol 1177

Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178

Chemical Name	Thailand	Vietnam	Turkey
Mica	3 mg/m³ TWA	Not determined	Not determined
Glass fibers	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

Respiratory protection No protective equipment is needed under normal use conditions In case of inadequate ventilation wear respiratory protection Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Solid
Appearance Flakes
Odor Odorless
Color White - Amber

Property	Values	Remarks
pH	Not applicable	

pH @ dilution	No information available
Melting / freezing point	No information available
Boiling point/range	No information available
Flash point	No information available
Evaporation rate (BuAc =1)	No information available
Flammability	Not applicable
Explosion limits:	
Upper explosion limit	No information available
Lower explosion limit	No information available
Vapor pressure	No information available
Relative Vapor Density	No information available
Specific gravity	2.7 - 2.9
Bulk density	No information available
Water solubility	Insoluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
Partition Coefficient (n-octanol/water)	No information available
Density and/or Relative Density	No information available
Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact May cause skin irritation and/or dermatitis. Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Mica	No data available	No data available	No data available
Glass fibers	No data available	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Mica	No information available	No information available	No information available
Glass fibers	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Does not comply
Canada (DSL)	This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.

Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	30-Sep-2015
Revision date	15-Jul-2021
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D186
Version 8
Revision date 23-Aug-2019
Supersedes Date: 10-Feb-2016

Safety Data Sheet
Low Temperature Cement Set Enhancer D186

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Low Temperature Cement Set Enhancer D186
Product code D186

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H318 - Causes serious eye damage

Precautionary statements
P270 - Do not eat, drink or smoke when using this product
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P330 - Rinse mouth
P391 - Collect spillage

Contains
Calcium nitrate

2,2' -oxydiethanol

Calcium Bromide

2,2'-Methyliminodiethanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium nitrate	233-332-1	10124-37-5	10-30
2,2' -oxydiethanol	203-872-2	111-46-6	1-5
Calcium Bromide	232-164-6	7789-41-5	1-5
2,2'-Methyliminodiethanol	203-312-7	105-59-9	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting. If conscious, give 2 glasses of water. Get immediate medical attention. Never give anything by mouth to an unconscious person.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
High volume water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous combustion products
Fire or high temperatures create: Ammonia, Nitrogen oxides (NOx), Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Wear protective gloves/clothing and eye/face protection. Avoid contact with eyes. Do not get on skin or clothing. Wash thoroughly after handling. See also section 8.

6.2 Environmental precautions

Prevent further leakage or spillage. The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Acids Bases Strong reducing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium nitrate	Not determined	Not determined	Not determined
2,2' -oxydiethanol	Not determined	23ppmTWA 100mg/m³TWA	Not determined
Calcium Bromide	Not determined	Not determined	Not determined
2,2'-Methyliminodiethanol	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium nitrate	Not determined	Not determined	Not determined
2,2' -oxydiethanol	Not determined	Not determined	Not determined
Calcium Bromide	Not determined	Not determined	Not determined
2,2'-Methyliminodiethanol	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium nitrate	Not determined	Not determined	Not determined
2,2' -oxydiethanol	10 mg/m³ MAC	Not determined	23 ppm TWA 101 mg/m³ TWA
Calcium Bromide	Not determined	Not determined	Not determined
2,2'-Methyliminodiethanol	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium nitrate	Not determined	Not determined	Not determined
2,2' -oxydiethanol	Not determined	Not determined	10 mg/m³ MAC
Calcium Bromide	Not determined	Not determined	Not determined
2,2'-Methyliminodiethanol	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium nitrate	Not determined	Not determined	Not determined
2,2' -oxydiethanol	Not determined	Not determined	Not determined
Calcium Bromide	Not determined	Not determined	Not determined
2,2'-Methyliminodiethanol	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Nitrile PVC
Break through time >480 minutes
Glove thickness 0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor/acid gas protection (E, yellow) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	None
Color	Light green
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	8 - 10	
pH @ dilution	No information available	
Melting / freezing point	< -21 °C / -7 °F	
Boiling point/range	~ 108 °C / 226 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	~2 kPa	@ 25 °C
Vapor density	1 (air = 1)	
Specific gravity	1.4	
Bulk density	No information available	
Relative density	1.4	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	538 °C / 1000 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	2 mPa s	@ 15.5 °C
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
None under normal processing.

10.4 Conditions to avoid

Do not allow liquid to evaporate. Dry material is a strong oxidizer.

10.5 Incompatible materials

Acids. Bases. Strong reducing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapors may irritate throat and respiratory system.

Eye contact Causes serious eye damage.

Skin contact Irritating to skin. Substance may cause slight skin irritation.

Ingestion Harmful if swallowed.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium nitrate	No data available	No data available	No data available
2,2' -oxydiethanol	= 12565 mg/kg (Rat)	= 11890 mg/kg (Rabbit)	> 4600 mg/m³ (Rat) 4 h
Calcium Bromide	= 4100 mg/kg (Rat)	No data available	No data available
2,2'-Methyliminodiethanol	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Eye contact. Inhalation. Ingestion.
Routes of entry	Skin contact. Eye contact. Inhalation. Ingestion.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium nitrate	No information available	No information available	No information available
2,2' -oxydiethanol	= 75200 mg/L LC50 Pimephales promelas 96 h	No information available	= 84000 mg/L EC50 Daphnia magna 48 h
Calcium Bromide	No information available	No information available	No information available
2,2'-Methyliminodiethanol	No information available	No information available	No information available

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2,2' -oxydiethanol
Schedule 6
Schedule 5
Calcium Bromide
Schedule 4

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	10-Feb-2016
Revision date	23-Aug-2019

Version	8
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	1
Physical hazard	0
PPE	X

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SDS no. D230
Version 5
Revision date 23-Apr-2021
Supersedes Date: 05-Apr-2016

Safety Data Sheet
Low Temperature Dispersant D230

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Low Temperature Dispersant D230
Product code D230

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Heating of containers may cause pressure rise, with risk of bursting.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Protect from freezing
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Use protective gloves made of: Butyl rubber Nitrile rubber Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Characteristic
Color	Colorless

Property	**Values**	**Remarks**
pH	3.5 - 5.5	
pH @ dilution	No information available	
Melting / freezing point	~0 °C / ~32 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	No information available	
Relative Vapor Density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	1.006 - 1.046 g/ml	
Explosive properties	Not applicable	
Oxidizing properties	Not applicable	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None

Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from direct sunlight. Protect from freezing.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.
Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

The organic portion of this material is not biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Dispersible.

Mobility in soil
No information available.

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG) ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	05-Apr-2016
Revision date	23-Apr-2021
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	0
Flammability	0
Physical hazard	0
PPE	B

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SDS no. D154
Version 4
Revision date 22-Dec-2020
Supersedes Date: 08-Jun-2016

Safety Data Sheet
Low-Temperature Extender D154

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Low-Temperature Extender D154
Product code D154

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

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Contains
Fumed silica

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Fumed silica	273-761-1	69012-64-2	60-100
Crystalline silica (impurity)	238-878-4	14808-60-7	<0.1

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash skin thoroughly with soap and water. Call a physician if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
React with hydrofluoric acid (HF) forming toxic gas (SiF4).

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Vacuum up. Avoid generating dust. Put into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid handling causing generation of dust.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep at temperatures above 0°C React with hydrofluoric acid (HF) forming toxic gas (SiF4)

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Fumed silica	10 mg/m³ TWA 3 mg/m³ TWA 2 mg/m³ TWA	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Fumed silica	Not determined	2 mg/m³ TWA	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Fumed silica	Not determined	Not determined	2 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Fumed silica	2 mg/m³ TWA	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Fumed silica	Not determined	Not determined	Not determined

Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Repeated or prolonged contact Use protective gloves made of: Neoprene Nitrile rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing and gloves Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Gray - Off-white
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	N/D	
Melting / freezing point	>1200 °C/ 2192 °F	
Boiling point/range	No information available	
Flash point	Does not flash	

Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.1 - 2.3	
Bulk density	17 - 28.1 lb/ft^3	@ 20°C.
Relative density	No information available	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity		
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available
Particle Size (Micron)	> 45-Microns = 2.5 wt% max

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Keep at temperatures above 0°C.

10.5 Incompatible materials

Hydrofluoric acid (HF).

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fumed silica	>5000 mg/kg bw	>5000 mg/kg bw	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Fumed silica	LC50>100 mg/l	LC50>323 mg/l (72h)	LC50>1003 mg/l
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Fumed silica	Not Applicable - Inorganic chemical.
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Fumed silica	Not Applicable - Inorganic chemical.
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Fumed silica	Slightly soluble
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	08-Jun-2016
Revision date	22-Dec-2020
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D145A
Version 3
Revision date 17-Mar-2021
Supersedes Date: 03-Mar-2016

Safety Data Sheet
Low-Temperature Liquid Dispersant D145A

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Low-Temperature Liquid Dispersant D145A
Product code D145A

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Carcinogenicity	Category 1B

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H350 - May cause cancer

Precautionary statements
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

–

Contains
Formaldehyde (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Formaldehyde (impurity)	200-001-8	50-00-0	< 0.2

Comments
The product contains other ingredients which do not contribute to the overall classification.

Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.
Note D: Certain substances which are susceptible to spontaneous polymerisation or decomposition are generallyplaced on the market in a stabilised form. It is in this form that they are listed in Part 3.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash off immediately with soap and plenty of water. Remove contaminated clothing and shoes. Seek medical attention if irritation occurs.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Harmful organic chemical fumes.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate personnel to safe areas. Do not get on skin or clothing. Wash thoroughly after handling. Use personal protective

equipment. Do not breathe vapors or spray mist. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Protect from freezing Avoid contact with: Strong acids Strong bases Strong oxidizing agents Strong reducing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Formaldehyde (impurity)	0.3 ppm STEL 0.4 mg/m³ STEL	2ppmSTEL 2.5mg/m³STEL 1ppmTWA 1.2mg/m³TWA	0.3 ppm Ceiling 0.37 mg/m³ Ceiling Suspected Human Carcinogen 0.3 ppm TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Formaldehyde (impurity)	2 ppm STEL	0.3 ppm STEL	0.2 ppm Ceiling

	3 mg/m³ STEL 1.0 ppm TWA 1.5 mg/m³ TWA	0.3 mg/m³ STEL	0.24 mg/m³ Ceiling Group 2 airway sensitizer Group 1 skin sensitizer 0.1 ppm ACL 0.1 ppm OEL 0.12 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Formaldehyde (impurity)	0.5 mg/m³ MAC	0.016 ppm TWA 0.1 ppm STEL	0.5 ppm TWA 0.33 ppm TWA sensitiser Confirmed carcinogen 1 ppm Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Formaldehyde (impurity)	0.3 ppm Ceiling 0.37 mg/m³ Ceiling	Not determined	0.5 mg/m³ MAC (vapor)
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Formaldehyde (impurity)	2 ppm STEL 0.75 ppm TWA	0.5 mg/m³ TWA 1 mg/m³ STEL	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Butyl rubber Nitrile
Break through time >480 minutes
Glove thickness 0.7 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Characteristic
Color	No information available
Odor threshold	Not applicable

Property	Values	Remarks
pH	9.0 - 11.4	
pH @ dilution	No information available	Not applicable
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	~ 100 °C / 212 °F	
Flash point	Non-flammable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	30 - 60 mm2/s	@ 20 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	1.24 - 1.26 g/ml @ 20 °C

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time. Protect from freezing.

10.5 Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents. Strong reducing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Formaldehyde (impurity)	= 100 mg/kg (Rat)	= 270 mg/kg (Rabbit)	= 0.578 mg/L (Rat) 4 h

Sensitization EUH208 - Contains (Formaldehyde). May produce an allergic reaction.

Mutagenic effects Contains an known or suspected mutagen.

Carcinogenicity Contains a known or suspected carcinogen. Formaldehyde is listed by IARC in Group 1 as carcinogenic to humans.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Formaldehyde (impurity)	23.2 - 29.7 mg/L LC50 Pimephales promelas 96 h 100 - 136 mg/L LC50 Oncorhynchus mykiss 96 h 0.032 - 0.226 mL/L LC50 Oncorhynchus mykiss 96 h = 41 mg/L LC50 Brachydanio rerio 96 h = 1510 µg/L LC50 Lepomis macrochirus 96 h 22.6 - 25.7 mg/L LC50 Pimephales promelas 96 h	No information available	11.3 - 18 mg/L EC50 Daphnia magna 48 h = 2 mg/L LC50 Daphnia magna 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Formaldehyde (impurity)	Rapidly biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Formaldehyde (impurity)	Does not bioaccumulate log Pow =0.35

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
Formaldehyde (impurity)	Miscible in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Formaldehyde (impurity)	Henry's Law Constant 0.034 (in Pa m³/mol) @ 25 °C

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Formaldehyde (impurity)
Schedule 6

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002512
Group number	6.7A

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	03-Mar-2016
Revision date	17-Mar-2021
Version	3
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Key literature references and sources for data

www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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SDS no. D155
Version 4
Revision date 13-Nov-2019
Supersedes Date: 12-Feb-2016

Safety Data Sheet
Low-Temperature Liquid Extender D155

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Low-Temperature Liquid Extender D155
Product code D155

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Fumed silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Fumed silica	273-761-1	69012-64-2	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place React with hydrofluoric acid (HF) forming toxic gas (SiF4) Store above 0°C Protect from freezing

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Fumed silica	10 mg/m³ TWA 3 mg/m³ TWA 2 mg/m³ TWA	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Fumed silica	Not determined	2 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Fumed silica	Not determined	Not determined	2 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Fumed silica	2 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Fumed silica	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Rubber Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of inadequate ventilation wear respiratory protection Respirator with combination filter for vapor/particulate Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Slurry
Odor	Odorless
Color	Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	5-7	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	Similar to water.	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.4	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	

Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	70 mPa s	@ 20 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	50
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from freezing. Keep at temperatures above 0°C.

10.5 Incompatible materials

Hydrofluoric acid (HF).

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information	Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.
Inhalation	Breathing dried dust or spray mist may irritate respiratory tract.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fumed silica	>5000 mg/kg bw	>5000 mg/kg bw	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact. Inhalation.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Fumed silica	LC50>100 mg/l	LC50>323 mg/l (72h)	LC50>1003 mg/l

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	12-Feb-2016
Revision date	13-Nov-2019
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information

National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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SDS no. PID12248
Version 4
Revision date 02-Mar-2020
Supersedes Date: 06-Oct-2016

Safety Data Sheet
LUBE 776*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name LUBE 776*
Product code PID12248

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lubricant

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Castor oil, sulfated, sodium salt

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Castor oil, sulfated, sodium salt	269-123-7	68187-76-8	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Seek immediate medical attention/advice.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store at ambient conditions Avoid frost. Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Castor oil, sulfated, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Castor oil, sulfated, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Castor oil, sulfated, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**

Castor oil, sulfated, sodium salt	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Castor oil, sulfated, sodium salt	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: PVC Neoprene Nitrile
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Slight
Color	Light yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	5 - 7	@ 50g/l
Melting / freezing point	No information available	

Boiling point/range	No information available	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.95 - 1.00	@ 20°C.
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Store at ambient conditions. Avoid frost.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

LD50 Oral > 2000 mg/kg (rat) Calculated (MIXTURE)

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Castor oil, sulfated, sodium salt	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rat)24 h - similar substance	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Castor oil, sulfated, sodium salt	> 100 mg/l (LC50) similar substance - 96 h	> 10 mg/l (LC50) similar substance - 72 h	~ 100 mg/l (LC50) Suppliers data - 48 h

12.2 Persistence and degradability

Readily biodegradable.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Dispersible in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by

Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	06-Oct-2016
Revision date	02-Mar-2020
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. 143090
Version 1
Revision date 08-Jan-2019
Supersedes Date: None

Safety Data Sheet
LUBE EXE*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name LUBE EXE*
Product code 143090
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lubricant

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

-

Contains
2-[2-(2-butoxyethoxy)ethoxy]ethanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2-[2-(2-butoxyethoxy)ethoxy]ethanol	205-592-6	143-22-6	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Do not eat, drink or smoke when using this product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**

2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Neoprene PVC Rubber
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance No information available
Odor Slight
Color No information available
Odor threshold Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	

Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.95 - 1.05	@ 20°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-[2-(2-butoxyethoxy)ethoxy]ethanol	= 5300 mg/kg (Rat) Literature data	> 2000 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact.

Routes of entry Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-[2-(2-butoxyethoxy)ethoxy]ethanol	2200 - 4600 mg/L LC50 Leuciscus idus 96h = 2400 mg/L LC50 Pimephales promelas 96h	> 500 mg/L EC50 Desmodesmus subspicatus 72h	> 500 mg/L EC50 Daphnia magna 48h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Does not comply

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Revision date	08-Jan-2019
Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID926
Version 5
Revision date 09-Jul-2018
Supersedes Date: 28-Oct-2015

Safety Data Sheet
LUBE-167*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name LUBE-167*
Product code PID926

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lubricant

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains , No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
May cause slight irritation

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established.
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Mild
Color	Light brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	8.8 - 9.2	1% solution
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	116 °C / 240 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	>10	(Air = 1.0)
Specific gravity	0.96 - 1.01	25 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.
LD50 Oral	> 2000 mg/kg (rat) Calculated (PRODUCT)
Sensitization	This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is not biodegradable.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	28-Oct-2015
Revision date	09-Jul-2018
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SAFETY DATA SHEET

CALCIUM CHLORIDE

Revision Date: 22-Jun-2021 **Revision Number:** 2

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CALCIUM CHLORIDE

Other means of Identification

Synonyms None

Hazardous Material Number: MC600201

Recommended use of the chemical and restrictions on use

Recommended Use Intermediate

Uses advised against Consumer use

Supplier's name, address and phone number

Manufacturer/Supplier

Multi-Chem
A Halliburton Energy Services, Inc. Company
1 Ward Road
East Rockingham
WA 6168
Australia

Telephone Number: 61 (08) 9419 5300
Fax Number: 61 (08) 9439 1055
Emergency Telephone Number: + 61 1 800 686 951

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H319 - Causes serious eye irritation

Precautionary Statements

Prevention P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection

Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Calcium chloride	10043-52-4

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Calcium chloride	10043-52-4	60 - 100%	Eye Irrit. 2A (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure

Causes eye irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media
None - does not burn.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire
None anticipated

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Ensure adequate ventilation. Use appropriate protective equipment. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove. Pick up and transfer to properly labeled containers.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions
Ensure adequate ventilation. Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information
Store in a well ventilated area.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Calcium chloride	10043-52-4	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Ensure adequate ventilation, especially in confined areas

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN

	149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	10 (1 % solution)
Freezing Point / Range	No data available
Melting Point / Range	782 °C / 1439.6 °F
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	Not applicable.
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.8375 - 1.8625 (20 °C/68 °F)
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	110.986
VOC Content (%)	No data available
Liquid Density	15.31 - 15.53 lbs/gal
Bulk Density	1837 - 1863 kg/m^3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium chloride	10043-52-4	> 1000 mg/kg (Rat) 2301 mg/kg (Rat) > 2000 mg/kg (Rat) 2240 mg/kg (Rat)	5000 mg/kg (Rabbit)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes serious eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Calcium chloride	10043-52-4	Causes mild skin irritation (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Calcium chloride	10043-52-4	Causes moderate eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Calcium chloride	10043-52-4	No information available

Substances	CAS Number	Respiratory Sensitization
Calcium chloride	10043-52-4	No information available

Substances	CAS Number	Mutagenic Effects
Calcium chloride	10043-52-4	Did not show mutagenic effects in animal experiments

Substances	CAS Number	Carcinogenic Effects
Calcium chloride	10043-52-4	No information available

Substances	CAS Number	Reproductive toxicity
Calcium chloride	10043-52-4	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Calcium chloride	10043-52-4	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Calcium chloride	10043-52-4	No information available.

Substances	CAS Number	Aspiration hazard
Calcium chloride	10043-52-4	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

Product is not classified as hazardous to the environment.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Calcium chloride	10043-52-4	ErC50 (72h) 2900 mg/L (Pseudokirchnerella subcapitata) ErC50 (72h) 4000 mg/L (Pseudokirchnerella subcapitata)	LC50 (96h) 4630 mg/L (Pimephales promelas) LC50 (48h) >6560 mg/L (Pimephales promelas) LC50 (24h) >6660 mg/L (Pimephales promelas)	No information available	EC50 (48h) 2400 mg/L (Daphnia magna) EC50 (21d) 610 mg/L (reproduction) (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Calcium chloride	10043-52-4	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Calcium chloride	10043-52-4	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Calcium chloride	10043-52-4	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted

UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 22-Jun-2021

Revision Note
SDS sections updated:
11

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

Additional information: For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
OSHA
ECHA C&L

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End of Safety Data Sheet

SDS no. PID938
Version 12
Revision date 17-Jan-2020
Supersedes Date: 05-Mar-2019

Safety Data Sheet
M-I BAR* (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name M-I BAR* (All Grades)
Product code PID938

Synonyms M-I BAR*, M-I BAR* FINE, M-I BAR* ULTRA FINE

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Weighting agent.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Barite

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Barite	236-664-5	13462-86-7	60 - 100
Crystalline silica (impurity)	238-878-4	14808-60-7	5 - <10

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid wet and humid conditions.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Barite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Barite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Barite	6 mg/m³ MAC	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**

Barite	Not determined	Not determined	6 mg/m³ TWA Fibrogenic substance 0242
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178

Chemical Name	Thailand	Vietnam	Turkey
Barite	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile PVC Frequent change is advisable

Respiratory protection — In case of inadequate ventilation wear respiratory protection Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Solid
Appearance — Powder Dust
Odor — Odorless
Color — Tan - Gray
Odor threshold — Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	

Melting / freezing point	No information available
Boiling point/range	No information available
Flash point	Not applicable
Evaporation rate (BuAc =1)	No information available
Flammability (solid, gas)	Not applicable
Flammability Limit in Air	
Upper flammability limit	Not applicable
Lower flammability limit	Not applicable
Vapor pressure	No information available
Vapor density	No information available
Specific gravity	4.2 g/cm³ (minimum)
Bulk density	1.714-2.162 kg/m³ / 107-135 lb/ft3
Relative density	No information available
Water solubility	Insoluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid wet and humid conditions.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Respirable quartz <0.3% . Report number: N0600517.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barite	> 15000 mg/kg (Rat)	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Listed on PLONOR list of OSPAR

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Barite	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Product is not biodegradable. See component information below.

Chemical Name	Persistence and degradability
Barite	Inorganic compound
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Barite	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Barite	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Barite	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

CAS Number 7727-43-7 can be used to identify the substance mentioned in Section 3 for the International Inventories.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	05-Mar-2019
Revision date	17-Jan-2020
Version	12
This SDS has been revised in the following section(s)	1, 2, 3, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data

www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. PID982
Version 4
Revision date 17-Jan-2018
Supersedes date 08-Aug-2014

Safety Data Sheet
M-I GEL* SUPREME

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name M-I GEL* SUPREME
Product code PID982

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%	Component information
Crystalline silica (impurity)	238-878-4	14808-60-7	1-5	STOT Rep. 2 (H373)

3.2 Mixtures

Not applicable

Comments
Naturally occuring mineral.
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if

present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Phillippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Light tan - Gray Green
Odor threshold	Not applicable

Property	Values	Remarks
pH	9-10	
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		

Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.3 - 2.6	20 °C
Bulk density	48-52 lb/ft³ / 769-833 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand hazard classification	Not classified.
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations

2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes date	08-Aug-2014
Revision date	17-Jan-2018
Version	4
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
European Waste Catalog
European Agreement on International Transport of Dangerous Goods by Road (ADR)

Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

*A mark of M-I L.L.C., a Schlumberger Company

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID971
Version 4
Revision date 17-Feb-2020
Supersedes Date: 01-Feb-2016

Safety Data Sheet
M-I GEL*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name M-I GEL*
Product code PID971

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	< 10

3.2 Mixtures

Not applicable

Comments
Naturally occuring mineral.
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Provide eyewash station.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Cream - Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	9-10	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.3 - 2.6	@ 20 °C

Bulk density	48 – 52 lb/ft³ (769 – 833 kg/m³)
Relative density	No information available
Water solubility	Insoluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information	This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.
Listed on PLONOR list of OSPAR

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	01-Feb-2016
Revision date	17-Feb-2020
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. 142408
Version 8
Revision date 08-Mar-2019
Supersedes Date: 28-Sep-2017

Safety Data Sheet
M-I PAC* (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name M-I PAC* (All Grades)
Product code 142408

Synonyms M-I PAC* ELV, M-I PAC* R, M-I PAC* SR, M-I PAC* SUL, M-I PAC* UL
Molecular weight 982.4 g/mol

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Fluid loss reducer. Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Polyanionic cellulose

2.3 Other hazards

Suspended dust may present a dust explosion hazard
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Polyanionic cellulose	Listed	Proprietary	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Protect from moisture Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Polyanionic cellulose	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Polyanionic cellulose	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Polyanionic cellulose	10 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Polyanionic cellulose	Not determined	Not determined	10 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Polyanionic cellulose	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will

vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules Powder
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	6.5 - 9.5	@ 2% (20g/L)
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5 - 1.6	@ 20 °C
Bulk density	400 - 800 kg/m³	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	

Autoignition temperature	No information available
Decomposition temperature	~ 250°C / 482°F
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	982.4 g/mol
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture. Keep away from direct sunlight.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyanionic cellulose	= 27000 mg/kg (Rat)	> 2 g/kg (Rabbit)	> 5800 mg/m³ (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polyanionic cellulose	No information available	No information available	No information available

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date:	28-Sep-2017
Revision date	08-Mar-2019
Version	8
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D163
Version 7
Revision date 27-Jul-2018
Supersedes Date: 09-Jan-2015

Safety Data Sheet
Microfine Cement D163

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Microfine Cement D163
Product code D163

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1B
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Portland Cement Clinker

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Portland Cement Clinker	266-043-4	65997-15-1	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
The product itself does not burn, Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors React with hydrofluoric acid (HF) forming toxic gas (SiF4).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Avoid dust formation. Do not breathe dust. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Prevent dust cloud. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Pick up and transfer to properly labeled containers. Keep in suitable, closed containers for disposal. Clean contaminated surface thoroughly. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not breathe vapors/dust. Avoid contact with skin and eyes. Avoid handling causing generation of dust. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Do not eat, drink or smoke when using this product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Store away from incompatibles, Powdered aluminum Oxidizing agents Hydrofluoric acid (HF) Strong bases Strong acids
Storage class	Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Component Information

Chemical Name	Arabic	Australia	Egypt
Portland Cement Clinker	10 mg/m³ TWA	10 mg/m³ TWA	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Portland Cement Clinker	10 mg/m³ TWA	10 mg/m³ TWA	4 mg/m³ OEL 1 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Portland Cement Clinker	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Portland Cement Clinker	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Portland Cement Clinker	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Butyl Neoprene Nitrile Rubber Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	None
Color	Gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	11.0 -13.5	@ 10 g/l
Melting / freezing point	> 1250 °C / 2282 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	2.75 - 3.20 g/cm^3	
Bulk density	1040 kg/m^3	
Relative density	No information available	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	None known
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture.

10.5 Incompatible materials

Aluminium powder. Oxidizing agents. Strong acids. Strong bases. Hydrofluoric acid (HF).

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation May cause respiratory irritation. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation. Contact with moist skin may cause skin burns. May cause an allergic skin reaction.

Ingestion Ingestion may cause irritation to mucous membranes.

Unknown acute toxicity Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Portland Cement Clinker	No data available	No data available	No data available

Sensitization May cause allergic skin reaction.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Portland Cement Clinker	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Portland Cement Clinker	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Portland Cement Clinker	Product/Substance is inorganic

12.4 Mobility

Mobility
Slightly soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Portland Cement Clinker

Schedule 4
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	09-Jan-2015
Revision date	27-Jul-2018
Version	7
This SDS has been revised in the following section(s)	SDS fully updated in the new database.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*

Flammability	0
Physical hazard	0
PPE	X

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SDS no. D255
Version 3
Revision date 11-Jul-2019
Supersedes Date: 04-Jan-2018

Safety Data Sheet
Mid-Range FLAC D255

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Mid-Range FLAC D255
Product code D255

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

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Contains
2-methylpropan-2-ol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2-methylpropan-2-ol	200-889-7	75-65-0	<5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Ammonia, Hydrogen cyanide (hydrocyanic acid).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid generating or breathing dust. Take precautionary measures against static discharges. Take up mechanically and collect in suitable container for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid excessive heat for prolonged periods of time. Keep away from direct sunlight. Incompatible with oxidizing agents Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
2-methylpropan-2-ol	100 ppm TWA 303 mg/m³ TWA	150ppmSTEL 455mg/m³STEL 100ppmTWA 303mg/m³TWA	100 ppm TWA 303 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
2-methylpropan-2-ol	Not determined	100 ppm TWA 303 mg/m³ TWA	50 ppm OEL 150 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2-methylpropan-2-ol	10 mg/m³ MAC	Not determined	150 ppm STEL 455 mg/m³ STEL 100 ppm TWA 303 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2-methylpropan-2-ol	100 ppm TWA 303 mg/m³ TWA	100 ppm TWA 300 mg/m³ TWA	10 mg/m³ MAC

Chemical Name	Thailand	Vietnam	Turkey
2-methylpropan-2-ol	100 ppm TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Rubber gloves Butyl Neoprene Nitrile Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Solid
Appearance Granules
Odor None
Color White
Odor threshold Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	4 - 9	@ 5 g/l
Melting / freezing point	> 250 °C / 482 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		

Upper flammability limit	Not applicable
Lower flammability limit	Not applicable
Vapor pressure	Not applicable
Vapor density	Not applicable
Specific gravity	1.15 - 1.35
Bulk density	~ 0.20 - 0.40
Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	>150°C / >302° F
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Keep away from direct sunlight. Avoid excessive heat for prolonged periods of time. Keep away from open flames, hot surfaces and sources of ignition.

10.5 Incompatible materials

Incompatible with oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-methylpropan-2-ol	= 2200 mg/kg (Rat)	> 2 g/kg (Rabbit)	> 10000 ppm (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-methylpropan-2-ol	6130 - 6700 mg/L LC50 Pimephales promelas 96 h	> 1000 mg/L EC50 Desmodesmus subspicatus 72 h	4607 - 6577 mg/L EC50 Daphnia magna 48 h = 933 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow
<0

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required

Group number Not required

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA) Does not comply

Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	04-Jan-2018
Revision date	11-Jul-2019
Version	3
This SDS has been revised in the following section(s)	15. Regulatory Information No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D256
Version 2
Revision date 11-Jul-2019
Supersedes Date: 11-Apr-2016

Safety Data Sheet
Mid-Range liquid FLAC D256

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Mid-Range liquid FLAC D256
Product code D256

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Ammonia, Sulfur oxides, Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Contaminated surfaces will be extremely slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. If spilled, take caution, as material can cause surfaces to become very slippery. Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Avoid excessive heat for prolonged periods of time. Protect from freezing Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl Neoprene Nitrile Rubber Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the

work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Slight
Color	Light yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	3 - 7	
pH @ dilution	No information available	
Melting / freezing point	< 5 °C / 41 °F	
Boiling point/range	> 100 °C / 212 °F	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	Similar to water.	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	2.3 kPa @ 20°C	
Vapor density	Similar to water.	
Specific gravity	1.0 - 1.3	
Bulk density	No information available	
Relative density	1.0-1.3	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 100°C / 212°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from freezing. Keep away from direct sunlight. Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Incompatible with oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing >0.1%.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	Contains a known or suspected carcinogen.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards at concentrations >0.1%.

Routes of Exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation. Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Product has a low potential to bioconcentrate.

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	11-Apr-2016
Revision date	11-Jul-2019
Version	2
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	0
Flammability	0
Physical hazard	0
PPE	B

Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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SDS no. D801
Version 1
Revision date 12-Mar-2018
Supersedes Date: 09-Oct-2014

Safety Data Sheet
Mid-Temp Retarder-L D801

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Mid-Temp Retarder-L D801
Product code D801

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water. Remove contaminated clothing and shoes. Seek medical attention if irritation occurs.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Harmful organic chemical fumes.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Rubber Neoprene Nitrile Break through time >480 minutes Glove thickness >0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Opaque
Odor	Characteristic
Color	Dark brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	9 - 10	@ 10% sol.
Melting / freezing point	- 2 °C / 28 °F	
Boiling point/range	~ 101 °C / 214 °F	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Similar to water	
Vapor density	No information available	
Specific gravity	1.2 g/cm^3	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 242 °C / 468 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	500 mPa s	@ 20 °C
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.

Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	None known.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known. Check for additional information in sect. 7.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
Not regulated

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand hazard classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	09-Oct-2014
Revision date	12-Mar-2018
Version	1
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information

National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID11307
Version 9
Revision date 08-Jul-2018
Supersedes Date: 19-Feb-2016

Safety Data Sheet
M-I-X* II (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name M-I-X* II (All Grades)
Product code PID11307

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

–

Contains
Cellulose Fibre

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard
Product dust may be irritating to eyes, skin and respiratory system

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Cellulose	Listed	Proprietary	60-100
Crystalline silica (impurity)	238-878-4	14808-60-7	<2

3.2 Mixtures

Not applicable

Comments
Naturally occuring mineral.
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly after handling. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal,

state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Suspended dust may present a dust explosion hazard Protect from moisture Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Cellulose Fibre	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Cellulose Fibre	Not determined	10 mg/m³ TWA	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Cellulose Fibre	2 mg/m³ MAC	Not determined	10 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA

			Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Cellulose Fibre	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Cellulose Fibre	Not determined	10 mg/m³ TWA 5 mg/m³ TWA 20 mg/m³ STEL	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable

Respiratory protection — No personal respiratory protective equipment normally required In case of insufficient ventilation, wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Solid
Appearance — Powder Dust
Odor — Slight
Color — Tan
Odor threshold — Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.4 - 1.65	20 °C
Bulk density	352-513 kg/m³ / 22-32 lb/ft³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties No information available

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cellulose Fibre	> 5 g/kg (Rat)	> 2000 mg/kg (Rabbit) > 2 g/kg (Rabbit)	> 5800 mg/m³ (Rat) 4 h
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Cellulose Fibre	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

This product is expected to be readily biodegradable.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	19-Feb-2016
Revision date	08-Jul-2018
Version	9
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID1081
Version 10
Revision date 19-Mar-2018
Supersedes Date: 17-Dec-2014

Safety Data Sheet
MONOETHYLENE GLYCOL (MEG)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name MONOETHYLENE GLYCOL (MEG)
Product code PID1081

Synonyms MONOETHYLENE GLYCOL 100%, MEG 100%
Molecular weight 62.06 g/mol

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Commercial chemical

Uses advised against None known.

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

–

Contains
Ethylene Glycol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Ethylene Glycol	203-473-3	107-21-1	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation

develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Extinguishing media - small fires, Dry powder,
, Extinguishing media - large fires, Water spray, fog or regular foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt

Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	39.4 ppm Ceiling 100 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethylene Glycol	5 mg/m³ MAC	125 mg/m³ TWA 50.0 ppm TWA 100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Nitrile Neoprene Butyl rubber
Break through time >480 minutes
Glove thickness 0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection — No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more

information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Mild
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	6 - 7.5	@ 10%
Melting / freezing point	< -12 °C / 10.4 °F	
Boiling point/range	196 - 199 °C / 384.8 - 390.2 °F	
Flash point	111 °C / 231.8 °F	Closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	28 %	
Lower flammability limit	3.2 %	
Vapor pressure	0.007 kPa	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	410 °C / 770 °F	
Decomposition temperature	No information available	
Kinematic viscosity	21 mPas	@ 20 °C
Dynamic viscosity	No information available	
log Pow	-1.36	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	62.06 g/mol
VOC content(%)	None
Density	1.11 ± 0.03 g/ml @ 25°C

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapors may irritate throat and respiratory system. May cause additional affects as listed under "Ingestion".

Eye contact Contact with eyes may cause irritation.

Skin contact May be absorbed through the skin in harmful amounts. Prolonged contact may cause redness and irritation.

Ingestion Harmful if swallowed. May cause damage to organs through prolonged or repeated exposure.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene Glycol	= 7712 mg/kg (Rat) ECHA Data	> 3500 mg/kg (Mouse) ECHA Data	> 2.5 mg/l (Rat) 6 hour ECHA Data

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Ingestion. Inhalation.

Routes of entry Skin contact. Skin absorption. Ingestion.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure	Category 2.
Target organ effects	Kidney.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Listed on PLONOR list of OSPAR
The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene Glycol	40000 - 60000 mg/L LC50 (Pimephales promelas) = 96 h 40761 mg/L LC50 (Oncorhynchus mykiss) = 96 h 27540 mg/L LC50 (Lepomis macrochirus) = 96 h 14 - 18 mL/L LC50 (Oncorhynchus mykiss) = 96 h 16000 mg/L LC50 (Poecilia reticulata) = 96 h 41000 mg/L LC50 (Oncorhynchus mykiss) = 96 h	6500 - 13000 mg/L EC50 (Pseudokirchneriella subcapitata) = 96 h	46300 mg/L EC50 (Daphnia magna) = 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Ethylene Glycol	Readily biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Ethylene Glycol	log Pow -1.36(Calculated) Not likely to bioaccumulate

log Pow
-1.36

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
Ethylene Glycol	Completely soluble

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Ethylene Glycol	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated

IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code.
Proper Shipping Name: Ethylene glycol. Ship Type:- 3. Pollution Category:- Y.

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
Australian Standard for the Uniform Scheduling of Drugs and Poisons
Ethylene Glycol
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	17-Dec-2014
Revision date	19-Mar-2018
Version	10
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Follow general hygiene considerations recognized as common good workplace practices

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SDS no. D182
Version 4
Revision date 14-Jan-2021
Supersedes Date: 06-Jul-2020

Safety Data Sheet
MUDPUSH* II Spacer D182

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name MUDPUSH* II Spacer D182
Product code D182

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
High volume water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Keep away from direct sunlight. Incompatible with oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Rubber Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Mild Sweet
Color	Red brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	~8	650g/l (Soln)
Melting / freezing point	No information available	
Boiling point/range	Not applicable	
Flash point		
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	1.3	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Partly soluble Gel in contact with water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 242 °C / 468 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition. Keep away from direct sunlight. Take precautionary measures against static charges.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
Eye contact	Dust contact with the eyes can lead to mechanical irritation.
Skin contact	Repeated exposure may cause skin dryness or cracking.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

12.4 Mobility

Mobility
Partly soluble. Gel in contact with water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not classified
Group number	Not classified

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	06-Jul-2020
Revision date	14-Jan-2021
Version	4
This SDS has been revised in the following section(s)	15. Regulatory Information No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D161
Version 6
Revision date 15-Mar-2021
Supersedes Date: 11-Feb-2016

Safety Data Sheet
Multi-Temperature Cement Retarder D161

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Multi-Temperature Cement Retarder D161
Product code D161

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Reproductive toxicity	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H361 - Suspected of damaging fertility or the unborn child

Precautionary statements
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

–

Contains
Sodium pentaborate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium pentaborate	234-522-7	12007-92-0	5-10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Oxides of phosphorus, Carbon oxides (COx), Harmful organic chemical fumes.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Not to be used by pregnant workers and workers who have recently given birth or who are breastfeeding.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store away from heat and sources of ignition Avoid extreme temperatures Store above 0°C Store away from incompatibles, Strong reducing agents Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium pentaborate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium pentaborate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium pentaborate	Not determined	Not determined	Not determined

Chemical Name	Malaysia	Philippines	Russia
Sodium pentaborate	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium pentaborate	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Nitrile PVA PVC
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Slight
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	6.9	
pH @ dilution	No information available	
Melting / freezing point	~0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	Non-flammable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Not applicable
Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) None
Density 1.073 - 1.077 g/ml @ 20 °C

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Avoid extreme temperatures. Do not freeze.

10.5 Incompatible materials

Strong oxidizing agents. Strong reducing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort. May cause damage to organs through prolonged or repeated exposure.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium pentaborate	No data available	LD50 > 2000 mg/kg bw	LC50 > 2.03 mg/l

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity Product is or contains a chemical which is a known or suspected reproductive hazard.

Routes of Exposure Skin contact. Eye contact. Ingestion.

Routes of entry Ingestion.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium pentaborate	LC50: 600 mg/l 96h	No information available	LC50: 86 mg/l 48h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused Dispose of in accordance with local regulations.

products

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies Volume restriction.
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
Eurasian Economic Union: Russian Inventory	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	11-Feb-2016
Revision date	15-Mar-2021
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. U066
Version 3
Revision date 03-Sep-2018
Supersedes Date: 28-Sep-2016

Safety Data Sheet
Mutual Solvent U66

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Mutual Solvent U66
Product code U066

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Solvent in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Dermal	Category 4
Acute toxicity - Inhalation (Vapors)	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H302 - Harmful if swallowed
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H332 - Harmful if inhaled

Precautionary statements
P280 - Wear protective gloves and eye/face protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P362 - Take off contaminated clothing and wash before reuse

Supplementary precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P330 - Rinse mouth
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention
P403 + P235 - Store in a well-ventilated place. Keep cool
P501 - Dispose of contents/ container to an approved waste disposal plant

Contains
2-butoxyethanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
2-butoxyethanol	203-905-0	111-76-2	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. Get immediate medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Extinguish with carbon dioxide, dry chemical, foam or waterspray.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
When heated strongly or burned, oxides of carbon and harmful organic chemical fumes are released

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapors or mists. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil. Keep out of waterways.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded Keep away from direct sunlight. Incompatible with oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
2-butoxyethanol	25 ppm TWA 121 mg/m³ TWA	50ppmSTEL 242mg/m³STEL 20ppmTWA 96.9mg/m³TWA	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
2-butoxyethanol	Not determined	25 ppm TWA 121 mg/m³ TWA Skin notation	25 ppm ACL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2-butoxyethanol	5 mg/m³ MAC	Not determined	25 ppm TWA 121 mg/m³ TWA Possibility of significant uptake through the skin*1)
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2-butoxyethanol	20 ppm TWA 96.7 mg/m³ TWA Skin notation*3)	skin - potential for cutaneous absorption 50 ppm TWA 240 mg/m³ TWA	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2-butoxyethanol	50 ppm TWA	Not determined	50 ppm STEL 246 mg/m³ STEL Skin*2) 20 ppm TWA 98 mg/m³ TWA

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Safety glasses with side-shields For spills and emergencies, also wear face shield Use eye protection according to EN 166, designed to protect against liquid splashes

Hand protection
Impervious gloves made of: Rubber PVC Neoprene Be aware that liquid may penetrate the gloves. Frequent change is advisable. Wear gloves according to EN 374 resistant to the solvent(s) in use
Butyl rubber
Break through time >480 minutes
Glove thickness 0.5 mm
or
Impervious gloves of Fluorinated rubber
Break through time >480 minutes
Glove thickness mm 0.4

Respiratory protection
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators In case of inadequate ventilation wear respiratory protection Use respirator with organic vapor protection (A, brown) At work in confined or poorly

ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information Local authorities should be advised if significant spillages cannot be contained

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Ether
Color	Colorless
Odor threshold	No information available

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	-70 °C / -94 °F	
Boiling point/range	~170 °C / 338 °F	
Flash point	66 °C / 150.8 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	10.6 %	
Lower flammability limit	1.1 %	
Vapor pressure	0.1 kPa	@ 25 °C
Vapor density	4.1 (air = 1)	
Specific gravity	0.9 g/cm^3	25 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	~ 240 °C / 464 °F	
Decomposition temperature	> 242°C / 467.6 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	3 mPa s @25 °C	
log Pow	No information available	

Explosive properties	None known
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available

VOC content(%)	100
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Keep away from direct sunlight.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Harmful by inhalation.
Eye contact	Causes serious eye irritation.
Skin contact	Harmful in contact with skin. May be absorbed through the skin in harmful amounts. Irritating to skin.
Ingestion	Harmful if swallowed.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-butoxyethanol	1200 mg/kg (Guinea pigs)	> 2000 mg/kg (Rat)	400 ppm (Rabbit)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact. Ingestion.
Routes of entry	Inhalation. Skin absorption. Eye contact. Skin contact. Ingestion.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Target organ effects	Kidney. Central nervous system. Blood. Liver.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-butoxyethanol	= 2950 mg/L LC50 Lepomis macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 1698 - 1940 mg/L (LC50; Daphnia magna) = 1720 mg/L (EC50; water flea)

12.2 Persistence and degradability

Product is biodegradable.

Chemical Name	Persistence and degradability
2-butoxyethanol	Readily biodegradable

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

Chemical Name	Bioaccumulation

2-butoxyethanol	Not likely to bioaccumulate

log Pow
0.81

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
2-butoxyethanol	Soluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
2-butoxyethanol	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-butoxyethanol
Schedule 6

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	28-Sep-2016
Revision date	03-Sep-2018
Version	3

This SDS has been revised in the following section(s) 1, 2, 7, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	2
Physical hazard	0
PPE	X

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SDS no. 143482
Version 1
Revision date 01-Oct-2019
Supersedes Date: None

Safety Data Sheet
NaCl COMPLETION BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name NaCl COMPLETION BRINE
Product code 143482

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion brine.

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word

None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium Chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium Chloride	231-598-3	7647-14-5	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Oxides of:, Sodium, Chlorides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium Chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium Chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium Chloride	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium Chloride	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium Chloride	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Butyl PVC Break through time >480 minutes Glove thickness =>0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight
Color	Light amber
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	

Water solubility	No data available
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium Chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium Chloride	4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 -	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h

	7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h		

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
No information available.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies

Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Revision date	01-Oct-2019
Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
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SDS no. 141991
Version 3
Revision date 11-Jun-2020
Supersedes Date: 23-Dec-2016

Safety Data Sheet
NaCl POLYMER SYSTEM

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name NaCl POLYMER SYSTEM
Product code 141991

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Barite

Sodium Chloride

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Barite	236-664-5	13462-86-7	30-60
Sodium Chloride	231-598-3	7647-14-5	1-5
Crystalline silica (impurity)	238-878-4	14808-60-7	< 3

Comments
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician	Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Barite	Not determined	Not determined	Not determined
Sodium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**

Barite	Not determined	Not determined	Not determined
Sodium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Barite	6 mg/m³ MAC	Not determined	Not determined
Sodium Chloride	5 mg/m³ MAC	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Barite	Not determined	Not determined	6 mg/m³ TWA Fibrogenic substance 0242
Sodium Chloride	Not determined	Not determined	5 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Barite	Not determined	Not determined	Not determined
Sodium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Nitrile Neoprene PVC
Break through time >480 minutes
Glove thickness 0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more

information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Slight
Color	Light gray
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.2 - 1.6	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barite	> 15000 mg/kg (Rat)	No data available	No data available
Sodium Chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Barite	No information available	No information available	No information available
Sodium Chloride	4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Product is biodegradable. See component information below.

Chemical Name	Persistence and degradability
Barite	Inorganic compound
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Barite	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Barite	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Barite	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code.
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 23-Dec-2016

Revision date	11-Jun-2020
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SDS no. 143774
Version 2
Revision date 27-May-2020
Supersedes Date: 10-Apr-2012

Safety Data Sheet
NaCl/KCl BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name NaCl/KCl BRINE
Product code 143774
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Completion brine.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium Chloride

Potassium Chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium Chloride	231-598-3	7647-14-5	10-30
Potassium Chloride	231-211-8	7447-40-7	5-10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the

length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Sodium oxides, Potassium oxides, Chlorides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium Chloride	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium Chloride	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium Chloride	5 mg/m³ MAC	Not determined	Not determined
Potassium Chloride	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium Chloride	Not determined	Not determined	5 mg/m³ MAC
Potassium Chloride	Not determined	Not determined	5 mg/m³ MAC

Chemical Name	Thailand	Vietnam	Turkey
Sodium Chloride	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness =>0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance No information available
Odor Odorless
Color Colorless
Odor threshold Not applicable

Property	Values	Remarks
pH	~7	
pH @ dilution	No information available	

Melting / freezing point	No information available
Boiling point/range	> 100 °C / > 212 °F
Flash point	No information available
Evaporation rate (BuAc =1)	No information available
Flammability (solid, gas)	Not applicable
Flammability Limit in Air	
Upper flammability limit	Not applicable
Lower flammability limit	Not applicable
Vapor pressure	No information available
Vapor density	No information available
Specific gravity	1.15 - 1.21
Bulk density	No information available
Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium Chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h
Potassium Chloride	= 2600 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium Chloride	4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h
Potassium Chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Potassium Chloride
Schedule 4

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	10-Apr-2012
Revision date	27-May-2020
Version	2
This SDS has been revised in the following section(s)	All sections Product Code change This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D264
Version 2
Revision date 19-Jul-2018
Supersedes Date: 31-Oct-2017

Safety Data Sheet
Nano-Sealant D264

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Nano-Sealant D264
Product code D264

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Silicon Dioxide

Ethylene Glycol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Silicon Dioxide	231-545-4	7631-86-9	10-30
Ethylene Glycol	203-473-3	107-21-1	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating and toxic gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away

traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Silicon Dioxide	Not determined	2mg/m³TWArespirable dust	Not determined
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	39.4 ppm Ceiling 100 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Silicon Dioxide	10 mg/m³ TWA	Not determined	Not determined
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Silicon Dioxide	1 mg/m³ MAC 2 mg/m³ MAC	Not determined	Not determined
Ethylene Glycol	5 mg/m³ MAC	100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Silicon Dioxide	Not determined	Not determined	3 mg/m³ STEL 6 mg/m³ STEL 1 mg/m³ TWA 2 mg/m³ TWA Fibrogenic substance in the form of condensation aerosol containing it >60% 1121, 1122 Fibrogenic substance also vitreous,

			in the form of disintegration aerosol 1123
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Silicon Dioxide	Not determined	Not determined	Not determined
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl Nitrile
Break through time >480 minutes
Glove thickness 0.7 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance Aqueous solution
Odor Characteristic
Color Colorless - Milky white

Odor threshold Not applicable

Property	Values	Remarks
pH	9.0 - 10.5	@ 25 °C
pH @ dilution	No information available	
Melting / freezing point	< -7 °C / -20 °F	
Boiling point/range	100 °C / 212 °F	
Flash point		
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	23 hPa (@ 20°C)	
Vapor density	No information available	
Specific gravity	No information available	@ 20 °C
Bulk density	No information available	
Relative density	1.20-1.23	@ 20°C.
Water solubility	Soluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	<10 mPa s	
log Pow	No information available	

Explosive properties None known
Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) No information available
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Silicon Dioxide	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 2.2 mg/L (Rat) 1 h
Ethylene Glycol	= 4700 mg/kg (Rat)	= 9530 µL/kg (Rabbit) = 10600 mg/kg (Rat)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact. Inhalation. Ingestion.

Routes of entry Inhalation. Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that

large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Silicon Dioxide	= 5000 mg/L LC50 Brachydanio rerio 96 h	= 440 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 7600 mg/L EC50 Ceriodaphnia dubia 48 h
Ethylene Glycol	14 - 18 mL/L LC50 Oncorhynchus mykiss 96 h = 41000 mg/L LC50 Oncorhynchus mykiss 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h 40000 - 60000 mg/L LC50 Pimephales promelas 96 h = 40761 mg/L LC50 Oncorhynchus mykiss 96 h = 27540 mg/L LC50 Lepomis macrochirus 96 h	6500 - 13000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 46300 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

No product level data available.

Chemical Name	Persistence and degradability
Silicon Dioxide	No information available

12.3 Bioaccumulative potential

No product level data available.

Chemical Name	Bioaccumulation
Silicon Dioxide	Not likely to bioaccumulate

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol

Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	31-Oct-2017
Revision date	19-Jul-2018
Version	2
This SDS has been revised in the following section(s)	1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING Name change 7. Handling and storage 15. Regulatory Information No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID1146
Version 7
Revision date 08-Jul-2018
Supersedes Date: 28-Mar-2017

Safety Data Sheet
NUT PLUG* (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name NUT PLUG* (All Grades)
Product code PID1146

Synonyms NUT PLUG* FINE, NUT PLUG* MEDIUM, NUT PLUG* COARSE

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Product dust may be irritating to eyes, skin and respiratory system
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

3.2 Mixtures

Not applicable

Comments
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123,

			1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders
Use protective gloves made of: Neoprene Nitrile
Frequent change is advisable

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available
Odor	Odorless
Color	Tan - Brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	193 °C / 380 °F	PMCC
Evaporation rate (BuAc =1)	No information available	

Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.1 - 1.4	@ 20 °C
Bulk density	577–641 kg/m³ / 36–40 lb/ft3	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	Not applicable	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations

2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	28-Mar-2017
Revision date	08-Jul-2018
Version	7
This SDS has been revised in the following section(s)	2, 4, 5, 6, 7, 8, 10, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID1163
Version 9
Revision date 05-Jul-2018
Supersedes Date: 06-Apr-2015

Safety Data Sheet
OS-1L*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name OS-1L*
Product code PID1163

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Oxygen Scavenger.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Water

Ammonium hydrogensulfite

Sulphur Dioxide (Impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating and toxic gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Ammonium hydrogensulfite	233-469-7	10192-30-0	40-70
Water	231-791-2	7732-18-5	30-60
Sulphur Dioxide (Impurity)	231-195-2	7446-09-5	<1

Comments
Sulfur dioxide is not present as a substance. It is formed during decomposition.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Heating or fire can release toxic gas Sulphur dioxide, Nitrogen oxides (NOx), Oxides of:, Ammonia, Amines.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
This product slowly releases sulphur dioxide in contact with air. Use only in well-ventilated areas. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Acids Alkalis Keep at 5-30°C
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	Exposure limit noted is for decomposition product Sulfur dioxide.

No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	5 ppm STEL 13 mg/m³ STEL 2 ppm TWA 5.2 mg/m³ TWA	5ppmSTEL 13mg/m³STEL 2ppmTWA 5.2mg/m³TWA	5 ppm STEL 13 mg/m³ STEL 2 ppm TWA 5.2 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	5 ppm STEL; 10 mg/m³ STEL 2 ppm TWA 5 mg/m³ TWA	0.25 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	10 mg/m³ MAC	13.0 mg/m³ STEL 5.0 ppm STEL	5 ppm STEL 13 mg/m³ STEL 2 ppm TWA 5.2 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	2 ppm TWA 5.2 mg/m³ TWA	5 ppm TWA 13 mg/m³ TWA	Skin notation 10 mg/m³ MAC Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	5 ppm TWA	5 mg/m³ TWA 10 mg/m³ STEL	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with combination filter for vapour/particulate (EN 141) Chemical respirator with ammonia and amines cartridge (K/P2, green filter). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Pungent Sulfur
Color	Colorless - Pale yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	4.5 - 5.5	@ 20 °C
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	~ 100 °C / 212 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.3	
Bulk density	No information available	
Relative density	1.25 - 1.30 kg/dm3	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Reacts violently with oxidizers. Liberates poisonous sulfur dioxide gas on contact with acid.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Keep at temperatures between 5-30°C.

10.5 Incompatible materials

Strong oxidizing agents. Acids. Alkalis.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information	Bisulfites may cause skin sensitization in sulfite sensitive persons. Bisulfites may also cause respiratory sensitization in asthmatics and sulfite sensitive persons.
Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	Causes serious eye irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	> 90 mL/kg (Rat)	No data available	No data available
Ammonium hydrogensulfite	LD50= 2746 mg/kg - source: By analogy to product with similar composition. Notes: Related to male LD50> 2150 mg/kg By analogy	LD50> 2000 mg/kg - Duration: 24h. Source: By analogy to product with similar composition	LC50 > 5.5 mg/l - Duration: 4h. Source: By analogy to product with similar composition.

	to product with similar composition. Notes: Related to female		
Sulphur Dioxide (Impurity)	No data available	No data available	= 2500 ppm (Rat) 1 h

Sensitization Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact. Inhalation.

Routes of entry Eye contact. Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Water	No information available	No information available	No information available
Ammonium hydrogensulfite	OECD 203 Fish LC50 > 464 mg/l - Duration h: 96 - Notes: By analogy to product with similar composition	Algae EC50 = 43.8 mg/l - Duration h: 72 - Notes: By analogy to product with similar composition.	Daphnia magna EC50 = 89 mg/l - Duration h: 48 - Notes: By analogy to product with similar composition
Sulphur Dioxide (Impurity)	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Persistence and degradability
Ammonium hydrogensulfite	Not applicable

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Bioaccumulation
Ammonium hydrogensulfite	No data available

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Ammonium hydrogensulfite	No data available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated
New Zealand Hazard Classification Classified

HSNO approval no.	HSR002503 (Additives, Process Chemicals and Raw Materials (Subsidiary Hazard) Group Standard 2017.
Group number	6.4A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	06-Apr-2015
Revision date	05-Jul-2018
Version	9
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2*
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID1210
Version 8
Revision date 13-Mar-2019
Supersedes Date: 11-Jul-2018

Safety Data Sheet
PIPE-LAX* ENV

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name PIPE-LAX* ENV
Product code PID1210

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Stuck Pipe Additive.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention

Supplementary precautionary statements
P362 - Take off contaminated clothing and wash before reuse
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Potassium hydroxide

2.3 Other hazards

Thermal decomposition can lead to release of irritating gases and vapors
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Potassium hydroxide	215-181-3	1310-58-3	< 1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Do not induce vomiting without medical advice. Rinse mouth. Never give anything by mouth to an unconscious person. Get immediate medical attention.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, Carbon dioxide (CO_2).

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Potassium hydroxide	Not determined	Not determined	2 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Potassium hydroxide	Not determined	2 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Potassium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Potassium hydroxide	2 mg/m³ Ceiling	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Potassium hydroxide	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance No information available
Odor Slight

Color	Light brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	9.3	@ 1%
Melting / freezing point	< /= -5 °C / </= 23 °F	
Boiling point/range	No information available	
Flash point	88 °C / 190 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.02	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	-37°C / -35°F
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Causes skin irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Potassium hydroxide	= 284 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact.

Routes of entry None known.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Potassium hydroxide	= 80 mg/L LC50 Gambusia affinis 96 h	No information available	No information available

12.2 Persistence and degradability

Product is not biodegradable. See component information below.

Chemical Name	Persistence and degradability
Potassium hydroxide	Inorganic compound

12.3 Bioaccumulative potential

The product contains potentially bioaccumulating substances. See component information below.

Chemical Name	Bioaccumulation
Potassium hydroxide	Product/Substance is inorganic

12.4 Mobility

Mobility
Dispersible in water. See component information below.

Chemical Name	Mobility
Potassium hydroxide	Easily soluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Potassium hydroxide	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Potassium hydroxide
Schedule 6

Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	11-Jul-2018
Revision date	13-Mar-2019
Version	8
This SDS has been revised in the following section(s)	1, 2, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. 141381
Version 3
Revision date 26-Nov-2018
Supersedes Date: 28-Sep-2017

Safety Data Sheet
POLYPAC* (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLYPAC* (All Grades)
Product code 141381

Synonyms POLYPAC* ELV, R, UL & POLYPAC* SUPREME R, UL

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Fluid loss reducer. Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Polyanionic cellulose

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Polyanionic cellulose	Listed	Proprietary	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sodium oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Keep away from heat and sources of ignition.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Avoid dust formation Protect from moisture Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Polyanionic cellulose	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Polyanionic cellulose	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Polyanionic cellulose	10 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Polyanionic cellulose	Not determined	Not determined	10 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Polyanionic cellulose	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard

present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules Powder
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	6.5 - 8	@ 1% solution
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5 - 1.6	@ 25 °C
Bulk density	400 - 800 kg/m³	

Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	> 230°C / 446°F
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	Not determined

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyanionic cellulose	= 27000 mg/kg (Rat)	> 2 g/kg (Rabbit)	> 5800 mg/m³ (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polyanionic cellulose	No information available	No information available	No information available

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated

IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA) Complies

Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	28-Sep-2017
Revision date	26-Nov-2018
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID10571
Version 4
Revision date 13-Nov-2018
Supersedes Date: 03-Dec-2014

Safety Data Sheet
POLY-PLUS* 2000

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLY-PLUS* 2000
Product code PID10571
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier. Shale inhibitor. Fluid loss reducer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic

Alcohol, C11-14-iso-, C13-rich, ethoxylated

Hydrocarbons, C11-C12, isoalkanes, <2% aromatics

Naphtha (petroleum), hydrotreated heavy

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Contaminated surfaces will be extremely slippery

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	610-193-9	445411-73-4	<25
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Polymer	78330-21-9	<3
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	265-150-3	64742-48-9	<10
Naphtha (petroleum), hydrotreated heavy	265-150-3	64742-48-9	<10

Comments
The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

Based on test data - Eye Irritation (OECD 405), this product is not irritant.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Fire or high temperatures create:, Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special
Extremely slippery when spilled.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Contaminated surfaces will be extremely slippery.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Do not flush with water. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Extremely slippery when spilled.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Keep away from direct sunlight. Protect from freezing Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Hydrocarbons, C11-C12, isoalkanes, <2% aromatics: OSHA: 400 mg/m^3 (8 hrs) Naphtha (petroleum), hydrotreated heavy: OSHA: 400 mg/m^3 (8 hrs) No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	Not determined	Not determined	Not determined
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	Not determined	Not determined	Not determined
Naphtha (petroleum), hydrotreated heavy	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	Not determined	Not determined	Not determined
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	Not determined	Not determined	Not determined
Naphtha (petroleum), hydrotreated heavy	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	Not determined	Not determined	Not determined
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	Not determined	Not determined	Not determined
Naphtha (petroleum), hydrotreated heavy	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	Not determined	Not determined	Not determined
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	Not determined	Not determined	Not determined
Naphtha (petroleum), hydrotreated heavy	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	Not determined	Not determined	Not determined
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Not determined	Not determined	Not determined
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	Not determined	Not determined	Not determined
Naphtha (petroleum), hydrotreated heavy	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will

vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene PVC Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Faint hydrocarbon
Color	Milky
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	5 - 8	@ 5 g/l
Melting / freezing point	< 5 °C / < 41 °F	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	2.3 kPa	@ 20 °C
Vapor density	0.804 g/litre	@ 20 °C
Specific gravity	No information available	
Bulk density	No information available	

Relative density	1.0 - 1.2	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150°C / > 302°F	
Kinematic viscosity	> 20.5 cSt	@ 40 °C
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	Not applicable

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Keep away from direct sunlight. Protect from freezing.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 2.3 mg/L (Rat)
Alcohol, C11-14-iso-, C13-rich, ethoxylated	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rat)	No data available
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	> 6000 mg/kg (Rat)	> 3160 mg/kg (Rabbit)	> 8500 mg/m³ (Rat) 4 h
Naphtha (petroleum), hydrotreated heavy	> 6000 mg/kg (Rat)	> 3160 mg/kg (Rabbit)	> 8500 mg/m³ (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	No information available	No information available	No information available
Alcohol, C11-14-iso-, C13-rich, ethoxylated	No information available	No information available	No information available
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	= 2200 mg/L LC50 Pimephales promelas 96 h	No information available	= 2.6 mg/L LC50 Chaetogammarus marinus 96 h
Naphtha (petroleum), hydrotreated heavy	= 2200 mg/L LC50 Pimephales promelas 96 h	No information available	= 2.6 mg/L LC50 Chaetogammarus marinus 96 h

12.2 Persistence and degradability

Not readily biodegradable. See component information below.

Chemical Name	Persistence and degradability
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	Readily biodegradable OECD 301B 68.1% 28 days
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Readily biodegradable
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	Inherently biodegradable
Naphtha (petroleum), hydrotreated heavy	OECD 301 : 31.5% 28 days

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating. See component information below.

Chemical Name	Bioaccumulation
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	No information available
Alcohol, C11-14-iso-, C13-rich, ethoxylated	No information available
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	log Pow : 6.7-7.2
Naphtha (petroleum), hydrotreated heavy	No information available

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	No information available
Alcohol, C11-14-iso-, C13-rich, ethoxylated	Soluble in water
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	No data available
Naphtha (petroleum), hydrotreated heavy	No data available

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Gas oils (petroleum), vacuum, hydrocracked, hydroisomerized, hydrogenated, C10-25, branched and cyclic	No information available
Alcohol, C11-14-iso-, C13-rich, ethoxylated	No information available
Hydrocarbons, C11-C12, isoalkanes, <2% aromatics	No information available
Naphtha (petroleum), hydrotreated heavy	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 03-Dec-2014

Revision date 13-Nov-2018

Version	4
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID1236
Version 6
Revision date 12-Nov-2018
Supersedes Date: 30-Oct-2014

Safety Data Sheet
POLY-PLUS* DRY

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLY-PLUS* DRY
Product code PID1236

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale stabilizer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes extremely slippery when wet.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes extremely slippery when wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Suspended dust may present a dust explosion hazard Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene PVC Frequent change is

	advisable
Respiratory protection	No protective equipment is needed under normal use conditions In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Granular
Appearance	Powder Dust
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	5-9	@ 5 g/l
Melting / freezing point	> 150 °C / 302 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.25 - 1.40	20 °C
Bulk density	641-737 kg/m³ / 40 - 46 lb/ft³	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150 °C / 302 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

LD50 Oral	> 5000 mg/kg (rat) (PRODUCT)
LD50 Dermal	> 5000 mg/kg (rat) (PRODUCT)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is not biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility

Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 30-Oct-2014

Revision date	12-Nov-2018
Version	6
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID11709
Version 3
Revision date 27-Oct-2016
Supersedes Date: 03-Dec-2014

Safety Data Sheet
POLY-PLUS* EHV

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLY-PLUS* EHV
Product code PID11709

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains , No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Large spills released to the environment may disturb the natural chemical balance of soil/fresh water.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Granules Dust
Odor	None
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	6.0 - 8.0	@ 1% solution
Melting / freezing point	> 150 °C / > 302 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.8 sg (50 lbs./cu. Ft.)	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150°C / 302°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

LD50 Oral	> 5000 mg/kg (rat)
LD50 Dermal	> 5000 mg/kg (rat)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
IC50/Scenedesmus subspicatus/72 hrs > 100 mg/L (OECD201.

Toxicity to fish
LC50/Danio rerio/96 hrs > 100 mg/L (OECD203)
LC50/Oncorhynchus mykiss/96 hrs > 100 mg/L (OECD203).

Toxicity to daphnia and other aquatic invertebrates
EC50/Daphnia magna/48 hrs > 100 mg/L OECD202).

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow
-2

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil

No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	03-Dec-2014
Revision date	27-Oct-2016
Version	3
This SDS has been revised in the following section(s)	2, 3, 5, 6, 7, 8, 9, 12, 16 No changes with regard to classification have been made.

Key literature references and sources for data

www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID1241
Version 8
Revision date 16-Nov-2018
Supersedes Date: 26-Oct-2016

Safety Data Sheet
POLY-PLUS* RD

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLY-PLUS* RD
Product code PID1241

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard
Contaminated surfaces will be extremely slippery

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Contaminated surfaces will be extremely slippery.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes extremely slippery when wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields

Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene PVC Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Granules
Odor	Slight Hydrocarbon-like
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	7.7	@ 1% sol.
Melting / freezing point	> 150 °C / > 302 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.25 - 1.40	20 °C
Bulk density	641–737 kg/m³ (40–46 lb/ft²)	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150 °C / > 302 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	-2	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

LD50 Oral	> 5000 mg/kg (rat) (MIXTURE)
LD50 Dermal	> 5000 mg/kg (rat) (MIXTURE)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.
IC50/Scenedesmus subspicatus/72 hrs: > 100 mg/l (OECD 201).

Toxicity to fish
This product is not considered toxic to fish.
LV50/Danio rerio/96 hrs: > 100 mg/l (OECD 203)
LC50/Fathead minnow/96 hrs: > 100 mg/l (OECD 203).

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.
EC50/Daphnia magna/48 hrs.: > 100 mg/l (OECD202).

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow

-2

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	26-Oct-2016
Revision date	16-Nov-2018
Version	8
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. PID1231
Version 13
Revision date 09-Nov-2018
Supersedes Date: 09-Jul-2018

Safety Data Sheet
POLY-PLUS*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLY-PLUS*
Product code PID1231

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale control agent. Viscosifier. Friction reducer. Flocculating agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*

Isotridecanol, ethoxylated

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
May cause slight irritation

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	920-107-4	RM1003179	30-60
Isotridecanol, ethoxylated	NLP	69011-36-5	<3

Comments
OECD Test No. 437: Bovine Corneal Opacity and Permeability Test Method for Identifying i) Chemicals Inducing Serious Eye Damage and ii) Chemicals Not Requiring Classification for Eye Irritation or Serious Eye Damage: Not Irritant

The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

.

The product contains other ingredients which do not contribute to the overall classification.

*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Keep away from direct sunlight. Avoid contact with: Oxidizing agents Protect from freezing Keep at >5 - <30°C
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m^3 and ST. EXP = 10mg/m^3. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Not determined	Not determined	Not determined
Isotridecanol, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Not determined	Not determined	Not determined
Isotridecanol, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Not determined	Not determined	Not determined
Isotridecanol, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Not determined	Not determined	Not determined
Isotridecanol, ethoxylated	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Not determined	Not determined	Not determined
Isotridecanol, ethoxylated	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: PVC Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Hydrocarbon-like
Color	Milky
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	8.0 - 9.0	@ 1%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	> 93.3 °C / > 200 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	0.002 mmHg	@ 20°C (68°F) °C
Vapor density	No information available	
Specific gravity	1.07 - 1.10	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	> 20.5 cSt	@ 40 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	-28.9°C / -20°F
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from direct sunlight. Avoid frost. Keep at temperatures between >5-<30°C. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information OECD Test No. 437: Bovine Corneal Opacity and Permeability Test Method for Identifying i) Chemicals Inducing Serious Eye Damage and ii) Chemicals Not Requiring Classification for Eye Irritation or Serious Eye Damage: Not Irritant.

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	> 5000 mg/kg (OECD 401), Rat	> 5000 mg/kg (OECD 402), Rabbit	= 4951 mg/kg (OECD 403) 4H, Rat
Isotridecanol, ethoxylated	500-2000 mg/kg Rat	> 2000 mg/kg	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
IC50- 72 hours: > 100 mg/l (PRODUCT).

Toxicity to fish
LC50 - Oncorhynchus mykiss - 96 hours: > 100 mg/l (PRODUCT).

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphina - 48 hours: > 100 mg/l (PRODUCT).

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	> 1000 mg/l (OECD 201) Oncorhynchus mykiss/96 hours	> 1000 mg/l (OECD 201) Pseudokirchneriella subcapitata/72 hours	> 1000 mg/l (OECD 202) Daphnia magna/48 hours
Isotridecanol, ethoxylated	= 1-10 mg/l (OECD 203) Cyprinus carpio/96 hours	= 1-10 mg/l (OECD 201) Desmodesmus subspicatus/72 hours	= 1-10 mg/l (OECD 202) Daphnia magna/72 hours

12.2 Persistence and degradability

Readily biodegradable. See component information below.

Chemical Name	Persistence and degradability
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Readily biodegradable
Isotridecanol, ethoxylated	Readily biodegradable

12.3 Bioaccumulative potential

Bioaccumulation is unlikely. See component information below.

Chemical Name	Bioaccumulation
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Does not bioaccumulate
Isotridecanol, ethoxylated	Does not bioaccumulate

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	Insoluble
Isotridecanol, ethoxylated	Practically insoluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Hydrocarbons, C12-C15, n-alkanes, isoalkanes < 2% aromatics*	No information available
Isotridecanol, ethoxylated	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated
New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies

Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

CAS Number 64742-47-8 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	09-Jul-2018
Revision date	09-Nov-2018
Version	13
This SDS has been revised in the following section(s)	6. Accidental release measures No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID170
Version 6
Revision date 24-Dec-2018
Supersedes Date: 30-Dec-2015

Safety Data Sheet
POLY-SAL* HT

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLY-SAL* HT
Product code PID170
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Filtration-control. / Rheology modifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

-

Contains
Starch

Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Starch	Listed	Proprietary	60-100
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	208-576-7	533-74-4	< 1

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Suspended dust may present a dust explosion hazard Protect from moisture Avoid contact with: Strong oxidizing agents Sulfuric acid.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Starch	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Starch	Not determined	10 mg/m³ TWA	Not determined
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Starch	Not determined	Not determined	10 mg/m³ TWA

Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	2 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Starch	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	2 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Starch	Not determined	Not determined	Not determined
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Off-white
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	4-7	1%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	
Bulk density	300-700 kg/m^3 (19-44 lb/ft3)	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties No information available

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) No information available
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents. Sulfuric acid.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Starch	No data available	No data available	No data available
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	= 550 mg/kg (Rat)	= 7 g/kg (Rabbit)	= 8400 mg/m³ (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Starch	No information available	No information available	No information available
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	0.12 - 0.21 m LC50 Oncorhynchus mykiss 96 h 10.0 - 22.0 mg/L LC50 Cyprinus carpio 96 h 12 - 31.7 mg/L LC50 Oncorhynchus mykiss 96 h 0.2 - 0.4 mg/L LC50 Lepomis macrochirus 96 h	= 1 mg/L EC50 Desmodesmus subspicatus 96 h	0.26 - 0.37 mg/L EC50 Daphnia magna 48 h 9.5 - 14.8 mg/L EC50 Daphnia magna 48 h = 0.3 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the

occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	30-Dec-2015
Revision date	24-Dec-2018
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	0
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID1247
Version 4
Revision date 27-Nov-2017
Supersedes Date: 04-Dec-2014

Safety Data Sheet
POLY-SAL* T

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLY-SAL* T
Product code PID1247
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Fluid loss reducer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

_

Contains
Starch

2.3 Other hazards

Suspended dust may present a dust explosion hazard
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Starch	Listed	Proprietary	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to

hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Dry chemical, CO_2, water spray or regular foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Material becomes slippery when wet. Use caution if wet. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery. May cause sensitization of susceptible persons.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Take precautionary measures against static discharges. Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Starch	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Starch	Not determined	10 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Starch	Not determined	Not determined	10 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Starch	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Starch	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Local authorities should be advised if significant spillages cannot be contained See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules Powder Dust
Odor	Odorless
Color	Tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	5 - 7	@ 4%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	

Lower flammability limit	Not applicable
Vapor pressure	No information available
Vapor density	No information available
Specific gravity	No information available
Bulk density	400 - 561 kg/m³ / 23 - 35 lb/ft³
Relative density	1.5 sg
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid dust formation. Avoid contact with heat, sparks, open flame, and static discharge.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Starch	No data available	No data available	No data available

Sensitization Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Starch	No information available	No information available	No information available

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	04-Dec-2014
Revision date	27-Nov-2017
Version	4
This SDS has been revised in the following section(s)	All sections Product Code change There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID676
Version 4
Revision date 23-Nov-2018
Supersedes Date: 27-Oct-2016

Safety Data Sheet
POLYSWELL*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POLYSWELL*
Product code PID676

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Swells on contact with water. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with

water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep at 0-35°C Avoid contact with: Oxidizing agents Strong acids
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	None
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	> 150 °C / > 302 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.8 - 1.0	
Bulk density	0.65 - 0.75	
Relative density	No information available	
Water solubility	Insoluble in water Swells on contact with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150°C / 302°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available

VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep at temperatures between 0-35°C.

10.5 Incompatible materials

Oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

LD50 Oral	> 5000 mg/kg (rat) (MIXTURE)
LD50 Dermal	> 5000 mg/kg (rat) (MIXTURE)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
IC50/Scenedesmus subspicatus/72 hrs > 100 mg/L (OECD201.

Toxicity to fish
LC50/Danio rerio/96 hrs > 100 mg/L (OECD203)
LC50/Oncorhynchus mykiss/96 hrs > 100 mg/L (OECD203).

Toxicity to daphnia and other aquatic invertebrates
EC50/Daphnia magna/48 hrs > 100 mg/L OECD202).

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

log Pow
-2

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	27-Oct-2016
Revision date	23-Nov-2018
Version	4

This SDS has been revised in the following section(s) All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. 143296
Version 1
Revision date 07-May-2019
Supersedes Date: None

Safety Data Sheet
POROSEAL* Plus

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POROSEAL* Plus
Product code 143296
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Hydrocarbon.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away

traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Protect from freezing Avoid extreme temperatures Keep away from direct sunlight.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Use protective gloves made of: Nitrile Neoprene Break through time >480 minutes Glove thickness 0.4 mm

	Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Milky
Odor	Mild
Color	White
Odor threshold	No information available

Property	Values	Remarks
pH	5 - 8	
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 93 °C / 200 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	17.5 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.03	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from freezing. Avoid extreme temperatures. Keep away from direct sunlight.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.

Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Revision date	07-May-2019
Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories

National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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SDS no. PID17311
Version 6
Revision date 25-Mar-2021
Supersedes Date: 07-Apr-2016

Safety Data Sheet
POROSEAL*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POROSEAL*
Product code PID17311
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Filtration-control. Shale stabilizer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 67 009 214 162
Level 5
10 Telethon Avenue
Perth
WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin sensitization	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H317 - May cause an allergic skin reaction

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P272 - Contaminated work clothing should not be allowed out of the workplace
P280 - Wear protective gloves and eye/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P362 + P364 - Take off contaminated clothing and wash it before reuse

Contains
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	mixture	55965-84-9	< 0.005

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth

to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Hydrocarbon.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Protect from freezing

Storage class Chemical storage.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits The product does not contain any hazardous materials with occupational exposure limits established.

Component Information

Chemical Name	Arabic	Australia	Egypt
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**

5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection — No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight
Color	Milky white

Property	**Values**	**Remarks**
pH	10	conc. sol.
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / > 212 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	17.5 mmHg	@ 20 °C
Relative Vapor Density	No information available	
Specific gravity	1.02	
Bulk density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	
Explosive properties	Not applicable	
Oxidizing properties	None known.	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Protect from freezing.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one	= 53 mg/kg (Rat)	No data available	= 1.23 mg/L (Rat) 4 h = 0.11 mg/L (Rat) 4 h

Sensitization May cause sensitization by skin contact.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish. LC50 (96 hrs): 16188 mg/l (estimated).

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates. EC50 (48 hrs): 7471 mg/l (estimated).

Toxicology data for the components

12.2 Persistence and degradability
Not readily biodegradable.

12.3 Bioaccumulative potential
No product level data available.

12.4 Mobility
Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Other adverse effects
None known.

12.6 Other information.
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Maritime transport in bulk according to IMO instruments

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one
Schedule 6

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date:	07-Apr-2016
Revision date	25-Mar-2021
Version	6
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Follow general hygiene considerations recognized as common good workplace practices
Do not handle until all safety precautions have been read and understood

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID1290
Version 12
Revision date 14-Sep-2020
Supersedes Date: 27-Jul-2017

Safety Data Sheet
POTASSIUM CHLORIDE BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POTASSIUM CHLORIDE BRINE
Product code PID1290

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Completion brine.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
Potassium Chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Potassium Chloride	231-211-8	7447-40-7	5-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Seek medical attention if irritation occurs.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Chlorides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Strong acids Strong alkalies.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Potassium Chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Potassium Chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Potassium Chloride	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Potassium Chloride	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Potassium Chloride	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will

vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	~ 7	Conc.solution
pH @ dilution	No information available	
Melting / freezing point	-7 °C / 19.4 °F	
Boiling point/range	102 °C / 215.6 °F	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	

Specific gravity	1.01 - 1.17
Bulk density	No information available
Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong alkalies.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Potassium Chloride	= 2600 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Listed on PLONOR list of OSPAR

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Potassium Chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z. Proper Shipping Name: Potassium chloride solution

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Potassium Chloride
Schedule 4

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	27-Jul-2017
Revision date	14-Sep-2020
Version	12
This SDS has been revised in the following section(s)	2, 7, 8, 9, 11, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	B

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SDS no. M117
Version 4
Revision date 20-Jun-2018
Supersedes Date: 14-May-2015

Safety Data Sheet
Potassium Chloride M117

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Potassium Chloride M117
Product code M117

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Clay control agent in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating and toxic gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Crystalline
Odor	Very faint
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	8-11	H2O soln
Melting / freezing point	770 °C / 1418 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	1.100 kg/m³	
Relative density	1.989 g/cm³	
Water solubility	300 g/l	@ 20 °C
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

No information available.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Repeated exposure may cause skin dryness or cracking.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.
Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	14-May-2015
Revision date	20-Jun-2018
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	E

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SDS no. PID16813
Version 3
Revision date 28-Jun-2017
Supersedes Date: 03-Sep-2015

Safety Data Sheet
POWERVIS*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name POWERVIS*
Product code PID16813

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. If spilled, take caution, as material can cause surfaces to become very slippery. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep away from heat, sparks, and flame. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces,

respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Slight
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	~7	@ 1%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.5 sg	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	~351 °C / ~663.8 °F	
Decomposition temperature	~175°C / ~347°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid dust formation. Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

LD50 Oral	> 5000 mg/kg (rat) (product)
LC50 Inhalation	> 5 mg/l (dust) (rat, 4 hr)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	03-Sep-2015
Revision date	28-Jun-2017
Version	3
This SDS has been revised in the following section(s)	4, 8, 9, 10, 11, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID4
Version 9
Revision date 13-Mar-2019
Supersedes Date: 07-Jul-2018

Safety Data Sheet
PTS-200*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name PTS-200*
Product code PID4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Temperature stabilizer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Dermal	Category 4
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 1 Subcategory 1B
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards

Acute aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H312 - Harmful in contact with skin
H314 - Causes severe skin burns and eye damage
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302 + P350 - IF ON SKIN: Gently wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P363 - Wash contaminated clothing before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
2-aminoethanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of toxic and corrosive gases/vapors

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2-aminoethanol	205-483-3	141-43-5	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Immediate medical attention is required.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use halon type extinguisher.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Ammonia.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Prevent the formation of vapors, mists and aerosols. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong acids Strong oxidizing agents Nitrites Aluminum Copper Carbon steel Avoid extreme temperatures Keep away from direct sunlight.

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
2-aminoethanol	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA	6ppmSTEL 15mg/m³STEL 3ppmTWA 7.5mg/m³TWA	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
2-aminoethanol	Not determined	3 ppm TWA Skin notation 6 ppm STEL	3 ppm OEL 7.5 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2-aminoethanol	0.5 mg/m³ MAC	15.0 mg/m³ STEL 6.0 ppm STEL	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2-aminoethanol	3 ppm TWA 7.5 mg/m³ TWA	3 ppm TWA 6 mg/m³ TWA	0.5 mg/m³ MAC Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2-aminoethanol	3 ppm TWA	8 mg/m³ TWA 15 mg/m³ STEL	3 ppm STEL 7.6 mg/m³ STEL Skin 1 ppm TWA 2.5 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical

hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Chemical splash goggles and/or face shield
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Break through time >480 minutes Glove thickness 0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Amine
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	11.5 - 12	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	171 °C / 340 °F	
Flash point	> 96 °C / > 205 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	70 hPa	@ 20 °C

Vapor density	No information available
Specific gravity	1.0 - 1.02
Bulk density	No information available
Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	Not applicable
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

Avoid extreme temperatures. Keep away from direct sunlight.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Nitrites. Aluminum. Copper. Carbon steel.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Harmful by inhalation. Corrosive to the respiratory tract. May cause respiratory irritation. Vapours are corrosive. After 24-36 hours, injured persons may develop serious shortness of

	breath and lung oedema. Vapours irritate the respiratory system, and may cause coughing and difficulties in breathing.
Eye contact	Causes serious eye damage. May cause irreversible damage to eyes.
Skin contact	Harmful in contact with skin. Causes severe skin burns. May be absorbed through the skin in harmful amounts.
Ingestion	Harmful if swallowed. Can burn mouth, throat, and stomach.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-aminoethanol	= 1720 mg/kg (Rat)	= 1000 mg/kg (Rabbit) = 1 mL/kg (Rabbit)	> 1.3 mg/l Vapour 6h (Rat)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Eye contact. Ingestion. Inhalation.
Routes of entry	Ingestion. Inhalation. Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Category 3
Specific target organ toxicity - Repeated exposure	Not classified.
Target organ effects	Respiratory system.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates

See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-aminoethanol	> 200 mg/L LC50 Oncorhynchus mykiss 96 h = 3684 mg/L LC50 Brachydanio rerio 96 h 300 - 1000 mg/L LC50 Lepomis macrochirus 96 h 114 - 196 mg/L LC50 Oncorhynchus mykiss 96 h = 227 mg/L LC50 Pimephales promelas 96 h	= 15 mg/L EC50 Desmodesmus subspicatus 72 h	= 65 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not readily biodegradable. See component information below.

Chemical Name	Persistence and degradability
2-aminoethanol	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
2-aminoethanol	Does not bioaccumulate log Kow -1.91

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

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14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN2491
UN No. (IMDG/ANTAQ)	UN2491
UN No. (ICAO/ANAC)	UN2491

14.2. UN proper shipping name
Ethanolamine solution

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	III
IMDG/ANTAQ Packing group	III
ICAO/ANAC Packing group	III

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2X
Tunnel restriction code	(E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-aminoethanol
Schedule 4
Schedule 6
Schedule 5

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002984 (Ethanolamine, >26% in a non hazardous diluent)
Group number	N/A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	07-Jul-2018
Revision date	13-Mar-2019

Version	9
This SDS has been revised in the following section(s)	1, 2, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	1
Physical hazard	0
PPE	X

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SDS no. D013
Version 6
Revision date 15-Jan-2020
Supersedes Date: 17-Nov-2015

Safety Data Sheet
Retarder D013

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Retarder D013
Product code D013

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Fire or high temperatures create: Sulphur oxides, Carbon oxides (COx), Heating or fire can release toxic gas.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong oxidizing agents Strong acids Strong alkalies.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Faint
Color	Brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	4 - 5	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.2	20 °C
Bulk density	480 kg/m³	
Relative density	No information available	
Water solubility	Soluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong alkalies.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause irritation of respiratory tract.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Repeated exposure may cause skin dryness or cracking.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	17-Nov-2015
Revision date	15-Jan-2020
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D111
Version 6
Revision date 13-Nov-2019
Supersedes Date: 01-Aug-2016

Safety Data Sheet
RFC Agent D111

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name RFC Agent D111
Product code D111

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards

Corrosive to Metals	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P406 - Store in corrosion resistant container with a resistant inner liner

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse
P390 - Absorb spillage to prevent material damage
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Aluminum sulfate hydrate

Iron sulphate

Sulfuric acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Aluminum sulfate hydrate	233-135-0	10043-01-3	30-60
Iron sulphate	231-753-5	7720-78-7	1-5
Sulfuric acid	231-639-5	7664-93-9	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Immediate medical attention is required.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of toxic and corrosive gases/vapors Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong bases Metals

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Aluminum sulfate hydrate	Not determined	2mg/m³TWA	Not determined
Iron sulphate	Not determined	1mg/m³TWA	Not determined
Sulfuric acid	3 mg/m³ STEL 1 mg/m³ TWA	3mg/m³STEL 1mg/m³TWA	3 mg/m³ STEL Suspected Human Carcinogen 1 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Aluminum sulfate hydrate	Not determined	Not determined	Not determined
Iron sulphate	Not determined	Not determined	Not determined
Sulfuric acid	1 mg/m³ TWA	Not determined	1 mg/m³ Ceiling
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Aluminum sulfate hydrate	Not determined	Not determined	Not determined
Iron sulphate	Not determined	Not determined	Not determined
Sulfuric acid	1 mg/m³ MAC	1.0 mg/m³ TWA 3.0 mg/m³ STEL	1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Aluminum sulfate hydrate	Not determined	Not determined	2 mg/m³ STEL 0.5 mg/m³ TWA
Iron sulphate	Not determined	Not determined	Not determined
Sulfuric acid	1 mg/m³ TWA	1 mg/m³ TWA	Skin notation 1 mg/m³ MAC Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Aluminum sulfate hydrate	Not determined	Not determined	Not determined
Iron sulphate	Not determined	Not determined	Not determined
Sulfuric acid	1 mg/m³ TWA	1 mg/m³ TWA 2 mg/m³ STEL	0.05 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes
Chemical splash goggles and/or face shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Rubber
Break through time >480 minutes

	Glove thickness >=0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Solution
Odor	None
Color	Light green
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	1.5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / 212 °F	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.3	@ 20 °C
Bulk density	No information available	
Relative density	1.3	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	10 mm2/s	@ 20 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive. Corrosive to Metals.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong bases. Metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhaled corrosive substances can lead to a toxic edema of the lungs.
Eye contact	Causes serious eye damage.
Skin contact	Causes severe skin burns.
Ingestion	Ingestion causes burns of the upper digestive and respiratory tracts.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Aluminum sulfate hydrate	= 1930 mg/kg (Rat)	No data available	No data available
Iron sulphate	= 319 mg/kg (Rat)	= 155 mg/kg (Rat)	No data available
Sulfuric acid	= 2140 mg/kg (Rat)	No data available	85 - 103 mg/m³ (Rat) 1 h

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Inhalation. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Aluminum sulfate hydrate	= 37 mg/L LC50 Gambusia affinis 96 h = 100 mg/L LC50 Carassius auratus 96 h	No information available	= 136 mg/L EC50 Daphnia magna 15 min
Iron sulphate	= 0.56 mg/L LC50 Cyprinus carpio 96 h = 925 mg/L LC50 Poecilia reticulata 96 h	No information available	6.15 - 9.26 mg/L EC50 Daphnia magna 48 h = 152 mg/L EC50 Daphnia magna 48 h
Sulfuric acid	> 500 mg/L LC50 Brachydanio rerio 96 h	No information available	= 29 mg/L EC50 Daphnia magna 24 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN 3264
UN No. (IMDG/ANTAQ)	UN 3264
UN No. (ICAO/ANAC)	UN 3264

14.2. UN proper shipping name

CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (contains sulfuric acid),

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	III
IMDG/ANTAQ Packing group	III
ICAO/ANAC Packing group	III

14.5 Environmental hazard

No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2X
Tunnel restriction code	(E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Australian Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP)
Iron sulphate
Schedule 4
Schedule 6
Schedule 5
Sulfuric acid
Schedule 6

HSNO approval no.	HSR002542
Group number	8.1A, 8.3A, 8.2

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	01-Aug-2016
Revision date	13-Nov-2019
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID2687
Version 4
Revision date 04-Mar-2019
Supersedes Date: 29-Jun-2015

Safety Data Sheet
SACK BLACK*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SACK BLACK*
Product code PID2687
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale inhibitor.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd / ALPINE
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the

length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. If spilled, take caution, as material can cause surfaces to become very slippery. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Protect from moisture Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard

present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Black
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	140-205 °C / 284-401 °F	
Boiling point/range	No information available	
Flash point	315 °C / 590 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	

Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.04 - 1.06	@ 25 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	500 °C / 932 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	29-Jun-2015
Revision date	04-Mar-2019
Version	4
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID1361
Version 10
Revision date 09-Feb-2019
Supersedes Date: 07-Jul-2018

Safety Data Sheet
SAFE-CARB* (All Grades)

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-CARB* (All Grades)
Product code PID1361

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material. Weighting agent. Bridging material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Calcium carbonate

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Product dust may be irritating to eyes, skin and respiratory system

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Calcium carbonate	207-439-9	471-34-1	60-100
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

3.2 Mixtures

Not applicable

Comments
Naturally occuring mineral.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn.

Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium carbonate	Not determined	10mg/m³TWAinhalable dust	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium carbonate	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium carbonate	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA

			Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against powders and dusts
Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Repeated or prolonged contact
Use protective gloves made of: Nitrile Neoprene
Frequent change is advisable

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Solid
Appearance Powder Dust
Odor Odorless
Color White
Odor threshold Not applicable

Property	Values	Remarks
pH	Not applicable	

pH @ dilution	8.5 - 9.5	@ 100 g/l
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.6 - 2.8	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	825 °C / 1517°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Calcium carbonate	Not Applicable - Inorganic chemical.
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Calcium carbonate	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Calcium carbonate	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium carbonate	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	07-Jul-2018
Revision date	09-Feb-2019
Version	10
This SDS has been revised in the following section(s)	1, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	1
Physical hazard	0
PPE	E

*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. PID1370
Version 12
Revision date 14-Nov-2019
Supersedes Date: 11-Jan-2017

Safety Data Sheet
SAFE-COR*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-COR*
Product code PID1370

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Corrosion inhibitor

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	272-712-1	68909-77-3	30-60

Comments
Based on test data – Skin corrosion/irritation (OECD 404 Skin Rabbit), this product is not corrosive or irritant.
Based on test data – Serious eye damage/irritation (EPA OPPTS: 870.2400 Eye Rabbit), this product is irritant.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid frost. Store at room temperature Avoid contact with: Acids Nitrites
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Neoprene PVC Nitrile
Break through time >480 minutes
Glove thickness 0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing and gloves, including the inside, before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight
Color	Dark amber
Odor threshold	Not applicable

Property	Values	Remarks
pH	~ 11.5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	151.6 °C / 305 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.10	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	4 cP	@ 25 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	-12°C (<11°F)
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Store at room temperature. Avoid frost.

10.5 Incompatible materials

Acids. Do not add nitrites or other nitrosating agents to this product. May cause formation of nitrosamine.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	5000 mg/kg (Rat)	>2000 mg/kg (Rat)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact.

Routes of entry None known.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Not classified.

Repeated exposure

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	OECD; Acute LC50; 96 hours Semi-static; Fish > 45 g/l	OECD; Acute ErC50 (growth rate); 72 hours Static; Algae; 45 mg/kg OECD 201 Algae, Growth Inhibitor Test; Chronic NOECr; 72 hours Static; Algae; 3.2 mg/l	OECD; Acute EC50; 48 hours Static, Daphnia; > 100 g/l

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

No bioaccumulation expected due to high molecular weight.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR003599
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	11-Jan-2017
Revision date	14-Nov-2019
Version	12
This SDS has been revised in the following section(s)	1, 2, 7, 8, 9, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier

National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	1
Physical hazard	0
PPE	J

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SDS no. PID2290
Version 7
Revision date 20-Sep-2019
Supersedes Date: 24-Apr-2019

Safety Data Sheet
SAFE-LUBE*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-LUBE*
Product code PID2290
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lubricant

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards

Acute aquatic toxicity	Category 2

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation
H401 - Toxic to aquatic life

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P391 - Collect spillage

Contains
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	280-518-3	83682-78-4	5-<10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Characteristic
Color	Clear
Odor threshold	Not applicable

Property	Values	Remarks
pH	6.5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	> 93 °C / > 200 °F	
Flash point	> 93 °C / > 200 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.01	@ 16 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	Not applicable

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	> 2000 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Eye contact.
Routes of entry	Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Toxic to aquatic life

Toxicity to algae
EC50 1.9mg/l Skeletonema costatum (72h) - SLB Product level Data.

Toxicity to fish
LC50 > 4mg/l Scophthalmus maximus (96h) - SLB Product level Data.

Toxicity to daphnia and other aquatic invertebrates
LC50 31.5 mg/l Acartia tonsa (48h) - SLB Product level Data.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
1-Propanaminium, 3,3',3''-[phosphinylidynetris(oxy)]tris[N-(3-aminopropyl)-2-hydroxy-N,Ndimethyl-, N,N',N''-tri-C6-18 acyl derivs, trichlorides	LC50 1-10mg/l 96h	EC50 0.19 mg/l 72h	EC50 1-10mg/l 48h

12.2 Persistence and degradability

This product is expected to be readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	24-Apr-2019
Revision date	20-Sep-2019
Version	7
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Key literature references and sources for data

www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID1387
Version 9
Revision date 24-Oct-2019
Supersedes Date: 23-Nov-2016

Safety Data Sheet
SAFE-SCAV* CA

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SCAV* CA
Product code PID1387

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Oxygen Scavenger.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning,

flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents Strong bases Metals
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Butyl Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European

	Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Crystalline
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	5.5 - 8.0	@ 10%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.65	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available

Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges.

10.5 Incompatible materials

Metals. Strong bases. Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	None known.
Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	23-Nov-2016
Revision date	24-Oct-2019
Version	9

This SDS has been revised in the following section(s) 4, 6, 7, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID1388
Version 11
Revision date 13-Mar-2019
Supersedes Date: 02-Feb-2018

Safety Data Sheet
SAFE-SCAV* HS

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SCAV* HS
Product code PID1388

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Hydrogen Sulphide Scavenger.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Vapors)	Category 2
Serious eye damage/eye irritation	Category 2
Skin sensitization	Category 1
Specific target organ toxicity - Repeated exposure	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H330 - Fatal if inhaled
H372 - Causes damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P272 - Contaminated work clothing should not be allowed out of the workplace
P280 - Wear protective gloves/protective clothing and eye/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P314 - Get medical advice/attention if you feel unwell
P330 - Rinse mouth
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P391 - Collect spillage

Contains
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine

2-aminoethanol (Impurity)

Formaldehyde (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

H330 classification is applied due to Inhalation Acute Toxicity studies carried out in Aerosol form
Prevent the formation of aerosols.

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	225-208-0	4719-04-4	30-60
2-aminoethanol (Impurity)	205-483-3	141-43-5	<2
Formaldehyde (impurity)	200-001-8	50-00-0	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.
Formaldehyde is not present as a substance. It is formed during decomposition.

Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.
Note D: Certain substances which are susceptible to spontaneous polymerisation or decomposition are generallyplaced on the market in a stabilised form. It is in this form that they are listed in Part 3.

4. First Aid Measures

4.1 First aid measures

Inhalation — Call a physician or poison control center immediately. Move the exposed person to fresh air at once. Keep at rest. If breathing is difficult, (trained personnel should) give oxygen.

Ingestion — Rinse mouth. Never give anything by mouth to an unconscious person. Do not induce vomiting without medical advice. Seek medical attention at once.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention at once.

Eye Contact — Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use halon type extinguisher.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Formaldehyde.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not breathe vapors or spray mist. Avoid contact with skin and eyes. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product. Prevent the formation of vapors, mists and aerosols.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid frost. Avoid contact with: Strong acids Strong oxidizing agents

Storage class Toxic storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Formaldehyde is not present as a substance. It is formed during decomposition.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
2-aminoethanol (Impurity)	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA	6ppmSTEL 15mg/m³STEL 3ppmTWA 7.5mg/m³TWA	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Formaldehyde (impurity)	0.3 ppm STEL 0.4 mg/m³ STEL	2ppmSTEL 2.5mg/m³STEL 1ppmTWA 1.2mg/m³TWA	0.3 ppm Ceiling 0.37 mg/m³ Ceiling Suspected Human Carcinogen 0.3 ppm TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Group 1 skin sensitizer
2-aminoethanol (Impurity)	Not determined	3 ppm TWA Skin notation 6 ppm STEL	3 ppm OEL 7.5 mg/m³ OEL
Formaldehyde (impurity)	2 ppm STEL; 3 mg/m³ STEL 1.0 ppm TWA 1.5 mg/m³ TWA	0.3 ppm STEL 0.3 mg/m³ STEL	Group 2 airway sensitizer Group 1 skin sensitizer 0.1 ppm ACL 0.1 ppm OEL 0.12 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined

2-aminoethanol (Impurity)	0.5 mg/m³ MAC	15.0 mg/m³ STEL 6.0 ppm STEL	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Formaldehyde (impurity)	0.5 mg/m³ MAC	0.1 ppm STEL	0.5 ppm TWA 0.33 ppm TWA sensitiser Confirmed carcinogen 1 ppm Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
2-aminoethanol (Impurity)	3 ppm TWA 7.5 mg/m³ TWA	3 ppm TWA 6 mg/m³ TWA	Skin notation 0.5 mg/m³ MAC Skin
Formaldehyde (impurity)	0.3 ppm Ceiling 0.37 mg/m³ Ceiling	Not determined	0.5 mg/m³ MAC (vapor)
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
2-aminoethanol (Impurity)	3 ppm TWA	8 mg/m³ TWA 15 mg/m³ STEL	3 ppm STEL 7.6 mg/m³ STEL Skin 1 ppm TWA 2.5 mg/m³ TWA
Formaldehyde (impurity)	2 ppm STEL 0.75 ppm TWA	0.5 mg/m³ TWA 1 mg/m³ STEL	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Local exhaust ventilation When working in confined spaces (tanks, containers, etc.), ensure that there is a supply of air suitable for breathing and wear the recommended equipment

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes
Chemical splash goggles and/or face shield

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Impervious gloves made of: Nitrile Neoprene Butyl Rubber
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
Use respirator with organic vapor protection (A, brown) If there are conditions in which this triazine containing product produces a vapor, a chemical respirator with A1 + Formaldehyde and P3 particulate pre-filter combination would be required.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Amine
Color	Colorless - Pale yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	10.0 - 11.5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	67 °C / 152.6 °F	ASTM D 93-11
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	< -20°C / -4°F
Molecular weight	No information available
VOC content(%)	None
Density	1.05 - 1.15 g/ml @ 20°C

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Contact with strong acids develops formaldehyde.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Avoid frost.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product may contain or release trace amounts of formaldehyde. The International Agency for Research on Cancer (IARC) has classified formaldehyde as a Group 1carcinogen (limited evidence in humans, sufficient evidence in animals). Exposure to formaldehyde has been linked to adverse reproductive effects in some human and animal studies. In other reproductive studies, however, no adverse effects were noted. (Meditext). Formaldehyde may also cause skin sensitisation (allergic reaction).

Inhalation Fatal if inhaled. Causes damage to organs through prolonged or repeated exposure.

Eye contact Causes serious eye irritation.

Skin contact Causes skin irritation. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. May cause additional affects as listed under "Inhalation".

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	1000 mg/kg (Rat) (BASF AG, 1997)	> 4000 mg/kg (Rat) (BASF AG,1997)	0.371 mg/L (Aerosol) (Rat) (Triazine Taskforce, 2011)
2-aminoethanol (Impurity)	= 1720 mg/kg (Rat)	= 1000 mg/kg (Rabbit) = 1 mL/kg (Rabbit)	No data available
Formaldehyde (impurity)	= 100 mg/kg (Rat)	= 270 mg/kg (Rabbit)	= 0.578 mg/L (Rat) 4 h

Sensitization	May cause allergic skin reaction.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	Formaldehyde is listed by IARC in Group 1 as carcinogenic to humans.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation (Aerosol). Skin contact. Eye contact. Ingestion.
Routes of entry	Inhalation. Skin contact. Ingestion. Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Category 1.
Target organ effects	Respiratory system.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	> 168 mg/l LC50 96h Sheepshead Minnow (SLB data)	1.624 mg/l EC50 72h Skeletonema (SLB data)	99.68 mg/l KC50 48h Acartia (SLB data)
2-aminoethanol (Impurity)	114 - 196 mg/L LC50 Oncorhynchus mykiss 96 h = 227 mg/L LC50 Pimephales promelas 96 h = 3684 mg/L LC50 Brachydanio rerio 96 h 300 - 1000 mg/L LC50 Lepomis macrochirus 96 h > 200 mg/L LC50 Oncorhynchus mykiss 96 h	= 15 mg/L EC50 Desmodesmus subspicatus 72 h	= 65 mg/L EC50 Daphnia magna 48 h
Formaldehyde (impurity)	22.6 - 25.7 mg/L LC50 Pimephales promelas 96 h = 1510 µg/L LC50 Lepomis macrochirus 96 h = 41 mg/L LC50 Brachydanio rerio 96 h	No information available	11.3 - 18 mg/L EC50 Daphnia magna 48 h = 2 mg/L LC50 Daphnia magna 48 h

	0.032 - 0.226 mL/L LC50 Oncorhynchus mykiss 96 h 100 - 136 mg/L LC50 Oncorhynchus mykiss 96 h 23.2 - 29.7 mg/L LC50 Pimephales promelas 96 h		

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Readily biodegradable
2-aminoethanol (Impurity)	Readily biodegradable
Formaldehyde (impurity)	Rapidly biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not likely to bioaccumulate log Kow <=3
2-aminoethanol (Impurity)	Product does not bioaccumulate due to reaction with water
Formaldehyde (impurity)	Does not bioaccumulate log Pow =0.35

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Soluble in water
Formaldehyde (impurity)	Miscible in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Study does not need to be conducted because the substance is readily biodegradable
2-aminoethanol (Impurity)	Study does not need to be conducted because the substance is readily biodegradable
Formaldehyde (impurity)	Henry's Law Constant 0.034 (in Pa m³/mol) @ 25 °C

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN2810
UN No. (IMDG/ANTAQ)	UN2810
UN No. (ICAO/ANAC)	UN2810

14.2. UN proper shipping name
TOXIC LIQUID, ORGANIC, N.O.S. (Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine)

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	6.1
IMDG/ANTAQ Hazard class	6.1
ICAO/ANAC Hazard class/division	6.1

14.4 Packing group

ADR/RID/ADN/ADG Packing group	II
IMDG/ANTAQ Packing group	II
ICAO/ANAC Packing group	II

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	60
EmS (IMDG)	F-A, S-A
Emergency Action Code (EAC)	2X
Tunnel restriction code	(D/E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-aminoethanol (Impurity)
Schedule 4
Schedule 6
Schedule 5
Formaldehyde (impurity)
Schedule 6

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR005127
Group number	6.1D, 6.1E, 6.5B, 6.4A, 6.9A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-Feb-2018

Revision date	13-Mar-2019
Version	11
This SDS has been revised in the following section(s)	1, 2, 15, 16 There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood

HMIS classification

Health	3
Flammability	1
Physical hazard	0
PPE	J

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SDS no. PID16244
Version 5
Revision date 10-Jul-2018
Supersedes Date: 28-Jul-2016

Safety Data Sheet
SAFE-SCAV* HSB

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SCAV* HSB
Product code PID16244

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Hydrogen Sulphide Scavenger.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Vapors)	Category 3
Serious eye damage/eye irritation	Category 2
Skin sensitization	Category 1
Specific target organ toxicity - Repeated exposure	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H372 - Causes damage to organs through prolonged or repeated exposure

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P330 - Rinse mouth
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P311 - Call a POISON CENTER or doctor/physician
P314 - Get medical advice/attention if you feel unwell
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

Contains
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine

Water

Formaldehyde (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating and toxic gases and vapors

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	225-208-0	4719-04-4	30-60
Water	231-791-2	7732-18-5	30-60
Formaldehyde (impurity)	200-001-8	50-00-0	0-0.1

Comments
Based on test data - (ATE inhalation: 0.7232 mg/l) H330 does not apply.

Formaldehyde is not present as a substance. It is formed during decomposition. Formaldehyde is listed by IARC in Group 1 as carcinogenic to humans

Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.
Note D: Certain substances which are susceptible to spontaneous polymerisation or decomposition are generallyplaced on the market in a stabilised form. It is in this form that they are listed in Part 3.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Never give anything by mouth to an unconscious person.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Formaldehyde.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Acids Keep at -5 - 40°C

Storage class Toxic storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Formaldehyde is not present as a substance. It is formed during decomposition. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Formaldehyde (impurity)	0.3 ppm STEL 0.4 mg/m³ STEL	2ppmSTEL 2.5mg/m³STEL 1ppmTWA 1.2mg/m³TWA	0.3 ppm Ceiling 0.37 mg/m³ Ceiling Suspected Human Carcinogen 0.3 ppm TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Group 1 skin sensitizer
Water	Not determined	Not determined	Not determined
Formaldehyde (impurity)	2 ppm STEL; 3 mg/m³ STEL 1.0 ppm TWA 1.5 mg/m³ TWA	0.3 ppm STEL 0.3 mg/m³ STEL	Group 2 airway sensitizer Group 1 skin sensitizer 0.1 ppm ACL 0.1 ppm OEL 0.12 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Formaldehyde (impurity)	0.5 mg/m³ MAC	0.1 ppm STEL	0.5 ppm TWA 0.33 ppm TWA sensitiser Confirmed carcinogen 1 ppm Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined

Water	Not determined	Not determined	Not determined
Formaldehyde (impurity)	0.3 ppm Ceiling 0.37 mg/m³ Ceiling	Not determined	0.5 mg/m³ MAC (vapor)
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not determined	Not determined	Not determined
Water	Not determined	Not determined	Not determined
Formaldehyde (impurity)	2 ppm STEL 0.75 ppm TWA	0.5 mg/m³ TWA 1 mg/m³ STEL	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes
Chemical splash goggles and/or face shield

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) If there are conditions in which this triazine containing product produces a vapor, a chemical respirator with A1 + Formaldehyde and P2 particulate pre-filter combination would be required. At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance Aqueous solution

Odor	Amine
Color	Amber
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	< -20 °C / <-4 °F	
Boiling point/range	No information available	
Flash point	> 101 °C / > 213.8 °F	Closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.065 - 1.135	@ 16°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	<10 cSt	@ 40 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep at temperatures above -5 and < 40°C.

10.5 Incompatible materials

Strong oxidizing agents. Acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product may contain or release trace amounts of formaldehyde. The International Agency for Research on Cancer (IARC) has classified formaldehyde as a Group 1carcinogen (limited evidence in humans, sufficient evidence in animals). Exposure to formaldehyde has been linked to adverse reproductive effects in some human and animal studies. In other reproductive studies, however, no adverse effects were noted. (Meditext). Formaldehyde may also cause skin sensitisation (allergic reaction).

Inhalation Toxic if inhaled. Causes damage to organs through prolonged or repeated exposure.

Eye contact Causes serious eye irritation.

Skin contact May cause an allergic skin reaction.

Ingestion Harmful if swallowed. May cause additional affects as listed under "Inhalation".

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	1000 mg/kg (Rat) (BASF AG, 1997)	> 4000 mg/kg (Rat) (BASF AG,1997)	0.371 mg/L (Aerosol) (Rat) (Triazine Taskforce, 2011)
Water	> 90 mL/kg (Rat)	No data available	No data available
Formaldehyde (impurity)	= 100 mg/kg (Rat)	= 270 mg/kg (Rabbit)	= 0.578 mg/L (Rat) 4 h

Sensitization May cause sensitization by skin contact.

Mutagenic effects Contains an known or suspected mutagen.

Carcinogenicity Formaldehyde is listed by IARC in Group 1 as carcinogenic to humans.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Ingestion. Skin contact.

Routes of entry Inhalation. Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 1.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	> 168 mg/l LC50 96h Sheepshead Minnow (SLB data)	1.624 mg/l EC50 72h Skeletonema (SLB data)	99.68 mg/l KC50 48h Acartia (SLB data)
Water	No information available	No information available	No information available
Formaldehyde (impurity)	22.6 - 25.7 mg/L LC50 Pimephales promelas 96 h = 1510 µg/L LC50 Lepomis macrochirus 96 h = 41 mg/L LC50 Brachydanio rerio 96 h 0.032 - 0.226 mL/L LC50 Oncorhynchus mykiss 96 h 100 - 136 mg/L LC50 Oncorhynchus mykiss 96 h 23.2 - 29.7 mg/L LC50 Pimephales promelas 96 h	No information available	11.3 - 18 mg/L EC50 Daphnia magna 48 h = 2 mg/L LC50 Daphnia magna 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Readily biodegradable
Formaldehyde (impurity)	Rapidly biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Not likely to bioaccumulate log Kow <=3
Formaldehyde (impurity)	Does not bioaccumulate log Pow =0.35

log Pow
-1.5 - 0.2

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Soluble in water
Formaldehyde (impurity)	Miscible in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Hexahydro-1,3,5-tris(2-hydroxyethyl)-sym-triazine	Study does not need to be conducted because the substance is readily biodegradable
Formaldehyde (impurity)	Henry's Law Constant 0.034 (in Pa m³/mol) @ 25 °C

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN2810
UN No. (IMDG/ANTAQ) UN2810
UN No. (ICAO/ANAC) UN2810

14.2. UN proper shipping name

TOXIC LIQUID, ORGANIC, N.O.S. (2, 2', 2''-(hexahydro-1, 3, 5-triazine -1, 3, 5-triyl) triethanol)

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	6.1
IMDG/ANTAQ Hazard class	6.1
ICAO/ANAC Hazard class/division	6.1

14.4 Packing group

ADR/RID/ADN/ADG Packing group	II
IMDG/ANTAQ Packing group	II
ICAO/ANAC Packing group	II

14.5 Environmental hazard

No

14.6 Special precautions

Hazard identification no (ADR)	60
EmS (IMDG)	F-A, S-A
Emergency Action Code (EAC)	2X
Tunnel restriction code	(D/E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Formaldehyde (impurity)
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	28-Jul-2016
Revision date	10-Jul-2018
Version	5
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID11903
Version 3
Revision date 22-Dec-2020
Supersedes Date: 16-Mar-2016

Safety Data Sheet
SAFE-SCAV* HSW

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SCAV* HSW
Product code PID11903
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Hydrogen Sulphide Scavenger.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Dusts/Mists)	Category 3
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1
Specific target organ toxicity - Single exposure	Category 2

Specific target organ toxicity - Repeated exposure	Category 1

Environmental hazards Not classified

Physical Hazards

Flammable Liquids	Category 3

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H331 - Toxic if inhaled
H371 - May cause damage to organs
H372 - Causes damage to organs through prolonged or repeated exposure
H226 - Flammable liquid and vapor

Precautionary statements
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Supplementary precautionary statements
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P308 + P311 - IF exposed or concerned: Call a POISON CENTER or doctor
P314 - Get medical advice/attention if you feel unwell
P330 - Rinse mouth
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

P403 + P235 - Store in a well-ventilated place. Keep cool
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol

Methanol

2-aminoethanol

Formaldehyde (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	225-208-0	4719-04-4	30-60
Methanol	200-659-6	67-56-1	5-10
2-aminoethanol	205-483-3	141-43-5	1-5
Formaldehyde (impurity)	200-001-8	50-00-0	<1

Comments
Formaldehyde is not present as a substance. It is formed during decomposition.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Seek medical attention at once.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention at once.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Seek immediate medical attention/advice.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to

hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire, Do not use halon type extinguisher.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
FLAMMABLE. Vapors are heavier than air and may spread along floors. Vapors may travel considerable distance to source of ignition and flash back.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Formaldehyde.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG •3W

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Dike to collect large liquid spills. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Take precautionary measures against static discharges. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Ground and bond containers when transferring material. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Prevent the formation of vapors, mists and aerosols. Avoid spills and splashing during use. Avoid contact with skin, eyes and clothing. Avoid breathing vapors or mists. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges. Use spark-proof tools and explosion-proof equipment. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Oxidizing agents

Storage class Flammable liquid storage. Toxic storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Formaldehyde is not present as a substance. It is formed during decomposition.

Component Information

Chemical Name	Arabic	Australia	Egypt
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol	250 ppm STEL 328 mg/m³ STEL 200 ppm TWA 262 mg/m³ TWA	250ppmSTEL 328mg/m³STEL 200ppmTWA 262mg/m³TWA	250 ppm STEL 325 mg/m³ STEL Skin designation 200 ppm TWA 260 mg/m³ TWA

2-aminoethanol	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA	6ppmSTEL 15mg/m³STEL 3ppmTWA 7.5mg/m³TWA	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Formaldehyde (impurity)	0.3 ppm STEL 0.4 mg/m³ STEL	2ppmSTEL 2.5mg/m³STEL 1ppmTWA 1.2mg/m³TWA	0.3 ppm Ceiling 0.37 mg/m³ Ceiling Suspected Human Carcinogen 0.3 ppm TWA
Chemical Name	**India**	**Indonesian**	**Japan**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Group 1 skin sensitizer
Methanol	250 ppm STEL 310 mg/m³ STEL 200 ppm TWA 260 mg/m³ TWA	200 ppm TWA 250 ppm STEL	May cause substantial skin absorption 200 ppm ACL 200 ppm OEL 260 mg/m³ OEL
2-aminoethanol	Not determined	3 ppm TWA Skin notation 6 ppm STEL	3 ppm OEL 7.5 mg/m³ OEL
Formaldehyde (impurity)	2 ppm STEL 3 mg/m³ STEL 1.0 ppm TWA 1.5 mg/m³ TWA	0.3 ppm STEL 0.3 mg/m³ STEL	0.2 ppm Ceiling 0.24 mg/m³ Ceiling Group 2 airway sensitizer Group 1 skin sensitizer 0.1 ppm ACL 0.1 ppm OEL 0.12 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol	5 mg/m³ MAC	260 mg/m³ TWA 200 ppm TWA Skin notation 325 mg/m³ STEL 250 ppm STEL	250 ppm STEL 328 mg/m³ STEL 200 ppm TWA 262 mg/m³ TWA Possibility of significant uptake through the skin
2-aminoethanol	0.5 mg/m³ MAC	8.0 mg/m³ TWA 3.0 ppm TWA 15.0 mg/m³ STEL 6.0 ppm STEL	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Formaldehyde (impurity)	0.5 mg/m³ MAC	0.016 ppm TWA 0.1 ppm STEL	0.5 ppm TWA 0.33 ppm TWA sensitiser Confirmed carcinogen 1 ppm Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol	200 ppm TWA 262 mg/m³ TWA Skin notation	200 ppm TWA 260 mg/m³ TWA	15 mg/m³ STEL Skin notation 5 mg/m³ TWA Skin
2-aminoethanol	3 ppm TWA 7.5 mg/m³ TWA	3 ppm TWA 6 mg/m³ TWA	0.5 mg/m³ MAC Skin
Formaldehyde (impurity)	0.3 ppm Ceiling 0.37 mg/m³ Ceiling	Not determined	0.5 mg/m³ MAC (vapor)
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not determined	Not determined	Not determined
Methanol	Not determined	50 mg/m³ TWA 100 mg/m³ STEL	Skin 200 ppm TWA 260 mg/m³ TWA
2-aminoethanol	3 ppm TWA	8 mg/m³ TWA 15 mg/m³ STEL	3 ppm STEL 7.6 mg/m³ STEL Skin 1 ppm TWA

			2.5 mg/m³ TWA
Formaldehyde (impurity)	2 ppm STEL 0.75 ppm TWA	0.5 mg/m³ TWA 1 mg/m³ STEL	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Use protective gloves made of: Nitrile Neoprene Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection — Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) If there are conditions in which this triazine containing product produces a vapor, a chemical respirator with A1 + Formaldehyde and P2 particulate pre-filter combination would be required. At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Amine
Color	Pale yellow - Straw
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	10 - 11.5	(5% IPA/H20)
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	52 °C / 125.6 °F	Closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	63.7 mmHg	@ 37.8 °C
Vapor density	>1	(Air = 1.0)
Specific gravity	1.074	@ 16 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	14-16 cPs	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	-37°C (-34.6°F)
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

FLAMMABLE LIQUID AND VAPOR. Contact with strong acids develops formaldehyde.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Keep away from open flames, hot surfaces and sources of ignition.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product may contain or release trace amounts of formaldehyde. The International Agency for Research on Cancer (IARC) has classified formaldehyde as a Group 1carcinogen (limited evidence in humans, sufficient evidence in animals). Exposure to formaldehyde has been linked to adverse reproductive effects in some human and animal studies. In other reproductive studies, however, no adverse effects were noted. (Meditext). Formaldehyde may also cause skin sensitisation (allergic reaction).

Inhalation Toxic if inhaled. Causes damage to organs through prolonged or repeated exposure.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation. May cause an allergic skin reaction. Components of the product may be absorbed into the body through the skin.

Ingestion Harmful if swallowed.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,2',2"-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	1000 mg/kg (Rat) (BASF AG, 1997)	> 4000 mg/kg (Rat) (BASF AG,1997)	0.371 mg/L (Aerosol) (Rat) (Triazine Taskforce, 2011)
Methanol	= 6200 mg/kg (Rat)	= 15840 mg/kg (Rabbit) = 15800 mg/kg (Rabbit)	= 22500 ppm (Rat) 8 h = 64000 ppm (Rat) 4 h
2-aminoethanol	= 1720 mg/kg (Rat)	= 1000 mg/kg (Rabbit) = 1 mL/kg (Rabbit)	> 1.3 mg/l Vapour 6h (Rat)
Formaldehyde (impurity)	= 100 mg/kg (Rat)	= 270 mg/kg (Rabbit)	= 0.578 mg/L (Rat) 4 h

Sensitization May cause sensitization by skin contact.

Mutagenic effects This substance has no evidence of mutagenic properties.

Carcinogenicity Formaldehyde is listed by IARC in Group 1 as carcinogenic to humans.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Ingestion. Skin contact. Eye contact.

Routes of entry Inhalation. Ingestion. Skin absorption.

Specific target organ toxicity - Single exposure Category 2

Specific target organ toxicity - Repeated exposure Category 1.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	> 168 mg/l LC50 96h Sheepshead Minnow (SLB data)	1.624 mg/l EC50 72h Skeletonema (SLB data)	99.68 mg/l KC50 48h Acartia (SLB data)
Methanol	13500 - 17600 mg/L LC50 Lepomis macrochirus 96 h 18 - 20 mL/L LC50 Oncorhynchus mykiss 96 h 19500 - 20700 mg/L LC50 Oncorhynchus mykiss 96 h > 100 mg/L LC50 Pimephales promelas 96 h = 28200 mg/L LC50 Pimephales promelas 96 h	EC50= 22000 mg/l - Duration h: 96 - Notes: Literature data.	EC50> 10000 mg/l - Duration h: 48 - Notes: Literature data.
2-aminoethanol	> 200 mg/L LC50 Oncorhynchus mykiss 96 h = 3684 mg/L LC50 Brachydanio rerio 96 h 300 - 1000 mg/L LC50 Lepomis macrochirus 96 h 114 - 196 mg/L LC50 Oncorhynchus mykiss 96 h = 227 mg/L LC50 Pimephales promelas 96 h	= 15 mg/L EC50 Desmodesmus subspicatus 72 h	= 65 mg/L EC50 Daphnia magna 48 h
Formaldehyde (impurity)	23.2 - 29.7 mg/L LC50 Pimephales promelas 96 h 100 - 136 mg/L LC50 Oncorhynchus mykiss 96 h 0.032 - 0.226 mL/L LC50 Oncorhynchus mykiss 96 h = 41 mg/L LC50 Brachydanio rerio 96 h = 1510 µg/L LC50 Lepomis macrochirus 96 h 22.6 - 25.7 mg/L LC50 Pimephales promelas 96 h	No information available	11.3 - 18 mg/L EC50 Daphnia magna 48 h = 2 mg/L LC50 Daphnia magna 48 h

12.2 Persistence and degradability

Readily biodegradable. See component information below.

Chemical Name	Persistence and degradability
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Readily biodegradable
2-aminoethanol	Readily biodegradable
Formaldehyde (impurity)	Rapidly biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Not likely to bioaccumulate log Kow <=3
2-aminoethanol	Does not bioaccumulate log Kow -1.91
Formaldehyde (impurity)	Does not bioaccumulate log Pow =0.35

log Pow
-1.5 - 0.2

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Soluble in water
Formaldehyde (impurity)	Miscible in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	Study does not need to be conducted because the substance is readily biodegradable
Formaldehyde (impurity)	Henry's Law Constant 0.034 (in Pa m^3/mol) @ 25 °C

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors. Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

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14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN2929
UN No. (IMDG/ANTAQ)	UN2929
UN No. (ICAO/ANAC)	UN2929

14.2. UN proper shipping name

Toxic liquids, flammable, organic, n.o.s., (2, 2',2"-(hexahydro-1,3,5-triazine-1,3,5-triyl)triethanol, methyl alcohol),

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	6.1 (3)
IMDG/ANTAQ Hazard class	6.1 (3)
ICAO/ANAC Hazard class/division	6.1 (3)

14.4 Packing group

ADR/RID/ADN/ADG Packing group	PG II
IMDG/ANTAQ Packing group	PG II
ICAO/ANAC Packing group	PG II

14.5 Environmental hazard

No

14.6 Special precautions

Hazard identification no (ADR)	63
EmS (IMDG)	F-E, S-D
Emergency Action Code (EAC)	•3W
Tunnel restriction code	(D/E)
Hazchem code ADG	•3W

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Methanol
Schedule 6
Schedule 5
2-aminoethanol
Schedule 4
Schedule 6
Schedule 5
Formaldehyde (impurity)
Schedule 6

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	16-Mar-2016
Revision date	22-Dec-2020
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	2
Physical hazard	0
PPE	X

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SDS no. PID1392
Version 11
Revision date 14-Mar-2019
Supersedes Date: 09-Jul-2018

Safety Data Sheet
SAFE-SCAV* NA

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SCAV* NA
Product code PID1392

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Oxygen Scavenger.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Water

Ammonium hydrogensulfite

Sulphur Dioxide (Impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Water	231-791-2	7732-18-5	30-60
Ammonium hydrogensulfite	233-469-7	10192-30-0	30-60
Sulphur Dioxide (Impurity)	231-195-2	7446-09-5	<1

Comments
Sulfur dioxide is not present as a substance. It is formed during decomposition.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
Eye Contact	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Heating or fire can release toxic gas Sulphur oxides, Nitrogen oxides (NOx), Oxides of:, Ammonia, Amines.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
This product slowly releases sulphur dioxide in contact with air. Use only in well-ventilated areas. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Acids Alkalis Keep at 5-30°C
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Exposure limit noted is for decomposition product Sulfur dioxide. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	5 ppm STEL 13 mg/m³ STEL 2 ppm TWA 5.2 mg/m³ TWA	5ppmSTEL 13mg/m³STEL 2ppmTWA 5.2mg/m³TWA	5 ppm STEL 13 mg/m³ STEL 2 ppm TWA 5.2 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	5 ppm STEL; 10 mg/m³ STEL 2 ppm TWA 5 mg/m³ TWA	0.25 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	10 mg/m³ MAC	13.0 mg/m³ STEL 5.0 ppm STEL	5 ppm STEL 13 mg/m³ STEL 2 ppm TWA 5.2 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	2 ppm TWA 5.2 mg/m³ TWA	5 ppm TWA 13 mg/m³ TWA	Skin notation 10 mg/m³ MAC Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Water	Not determined	Not determined	Not determined
Ammonium hydrogensulfite	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	5 ppm TWA	5 mg/m³ TWA 10 mg/m³ STEL	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with combination filter for vapour/particulate (EN 141) Chemical respirator with ammonia and amines cartridge (K/P2, green filter). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing

before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Pungent Sulfur
Color	Straw - Yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	4.9 - 5-5	1% solution
Melting / freezing point	No information available	
Boiling point/range	105 °C / 221 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	18 mmHg	@ 20 °C
Vapor density	<1	(Air = 1.0)
Specific gravity	1.3	
Bulk density	No information available	
Relative density	1.27 - 1.39	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Reacts violently with oxidizers. Liberates poisonous sulfur dioxide gas on contact with acid.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Keep at temperatures between 5-30°C.

10.5 Incompatible materials

Strong oxidizing agents. Acids. Alkalis.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information Bisulfites may cause skin sensitization in sulfite sensitive persons. Bisulfites may also cause respiratory sensitization in asthmatics and sulfite sensitive persons.

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	> 90 mL/kg (Rat)	No data available	No data available
Ammonium hydrogensulfite	LD50= 2746 mg/kg - source: By analogy to product with similar composition. Notes: Related to male LD50> 2150 mg/kg By analogy to product with similar composition.	LD50> 2000 mg/kg - Duration: 24h. Source: By analogy to product with similar composition	LC50 > 5.5 mg/l - Duration: 4h. Source: By analogy to product with similar composition.

	Notes: Related to female		
Sulphur Dioxide (Impurity)	No data available	No data available	= 2500 ppm (Rat) 1 h

Sensitization Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact. Inhalation.

Routes of entry Eye contact. Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Water	No information available	No information available	No information available
Ammonium hydrogensulfite	OECD 203 Fish LC50 > 464 mg/l - Duration h: 96 - Notes: By analogy to product with similar composition	Algae EC50 = 43.8 mg/l - Duration h: 72 - Notes: By analogy to product with similar composition.	Daphnia magna EC50 = 89 mg/l - Duration h: 48 - Notes: By analogy to product with similar composition
Sulphur Dioxide (Impurity)	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Persistence and degradability

Ammonium hydrogensulfite	Not applicable

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical. See component information below.

Chemical Name	Bioaccumulation
Ammonium hydrogensulfite	No data available

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Ammonium hydrogensulfite	No data available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002503
Group number	6.4A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies

Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	09-Jul-2018
Revision date	14-Mar-2019
Version	11
This SDS has been revised in the following section(s)	1, 2, 3, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID12078
Version 7
Revision date 13-Sep-2019
Supersedes Date: 10-Jun-2015

Safety Data Sheet
SAFE-SOLV* E

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SOLV* E
Product code PID12078

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Solvent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Aspiration toxicity	Category 1
Skin corrosion/irritation	Category 2
Skin sensitization	Category 1

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P331 - Do NOT induce vomiting
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse

Contains
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*

Orange, sweet, extract

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Vapors may form explosive mixtures with air

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	926-141-6	RM1004884	60-100
Orange, sweet, extract	232-433-8	8028-48-6	10-30

Comments
Terpenes and Terpenoids, sweet orange oil can also use CAS 68647-72-3.

*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing has stopped, begin artificial respiration. Seek medical attention at once.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. If vomiting occurs spontaneously, minimize the risk of aspiration by properly positioning the affected person. Never give anything by mouth to an unconscious person. Seek medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons

Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Vapors may form explosive mixture with air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m^3 and ST. EXP = 10mg/m^3.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene

	Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of inadequate ventilation wear respiratory protection Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Sweet
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	< -20 °C / -4 °F	
Boiling point/range	173 °C / 343.4 °F	
Flash point	65 °C / 149 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	5	
Lower flammability limit	0.7	
Vapor pressure	~2 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	0.81	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	Soluble organic solvents	
Autoignition temperature	230 °C / 446 °F	
Decomposition temperature	No information available	
Kinematic viscosity	<20.5 mm2/s	@ 40 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Vapours may form explosive mixtures with air
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Vapours may form explosive mixtures with air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system. May cause additional affects as listed under "Ingestion".
Eye contact	May cause irritation.
Skin contact	Causes skin irritation. May cause an allergic skin reaction. Repeated exposure may cause skin dryness or cracking.
Ingestion	May be fatal if swallowed and enters airways. Potential for aspiration if swallowed. Aspiration may cause pulmonary edema and pneumonitis.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	>5000 mg/kg (Rat)	No data available	>5000 mg/m³ (Rat, 8h) >5000 mg/kg (Rabbit)
Orange, sweet, extract	No data available	No data available	No data available

Sensitization May cause allergic skin reaction.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Ingestion. Skin contact. Inhalation.

Routes of entry Inhalation. Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed and enters airways.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available	1000 mg/l (Oncorhynchus mykiss, 96h	1000 mg/l (Daphnia magna), 48h
Orange, sweet, extract	> 1000 mg/l (Scophthalmus Maximus), 96h	No information available	451 mg/l (Acartia Tonsa), 48h

12.2 Persistence and degradability

Product is biodegradable. See component information below.

Chemical Name	Persistence and degradability

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Readily biodegradable

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating. See component information below.

Chemical Name	Bioaccumulation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Does not bioaccumulate

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002649
Group number	6.1E, 6.3A, 6.5B, 9.1D

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code
Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

CAS Number 64742-47-8 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	10-Jun-2015
Revision date	13-Sep-2019
Version	7
This SDS has been revised in the following section(s)	All sections Product Code change There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2*
Flammability	2
Physical hazard	0
PPE	J

*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. PID1405
Version 8
Revision date 06-Feb-2019
Supersedes Date: 22-Jul-2015

Safety Data Sheet
SAFE-SURF* E

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SURF* E
Product code PID1405

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Displacement Chemical

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Alcohols, C6-12, ethoxylated

Ethoxylated monoethanolamide of fatty acids of coconut oil

2-butoxyethanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Alcohols, C6-12, ethoxylated	Polymer	68439-45-2	5-10
Ethoxylated monoethanolamide of fatty acids of coconut oil	612-392-6	61791-08-0	5-10
2-butoxyethanol	203-905-0	111-76-2	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store above freezing temperature Avoid contact with: Strong acids Strong bases Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined
Ethoxylated monoethanolamide of fatty acids of coconut oil	Not determined	Not determined	Not determined
2-butoxyethanol	25 ppm TWA 121 mg/m³ TWA	50ppmSTEL 242mg/m³STEL 20ppmTWA 96.9mg/m³TWA	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined
Ethoxylated monoethanolamide of fatty acids of coconut oil	Not determined	Not determined	Not determined
2-butoxyethanol	Not determined	25 ppm TWA 121 mg/m³ TWA Skin notation	25 ppm ACL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined
Ethoxylated monoethanolamide of fatty acids of coconut oil	Not determined	Not determined	Not determined
2-butoxyethanol	5 mg/m³ MAC	Not determined	25 ppm TWA 121 mg/m³ TWA Possibility of significant uptake through the skin*1)
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined
Ethoxylated monoethanolamide of fatty acids of coconut oil	Not determined	Not determined	Not determined
2-butoxyethanol	20 ppm TWA 96.7 mg/m³ TWA Skin notation*3)	skin - potential for cutaneous absorption 50 ppm TWA 240 mg/m³ TWA	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined
Ethoxylated monoethanolamide of fatty acids of coconut oil	Not determined	Not determined	Not determined
2-butoxyethanol	50 ppm TWA	Not determined	50 ppm STEL 246 mg/m³ STEL Skin*2) 20 ppm TWA 98 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in

Skin and body protection	confined or poorly ventilated spaces, respiratory protection with air supply must be used. Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Slight
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	8.0	
pH @ dilution	No information available	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 93 °C / > 199.4 °F	
Evaporation rate (BuAc =1)	negligible	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.0	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	<2	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available

VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Store above freezing temperature.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong bases.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged contact may cause redness and irritation. May be absorbed through the skin in harmful amounts.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alcohols, C6-12, ethoxylated	1200 mg/kg - Litterature data (rat)	2000 mg/kg (rat)(based on components)	No data available
Ethoxylated monoethanolamide of fatty acids of coconut oil	> 2000 mg/kg (Rat)	No data available	No data available
2-butoxyethanol	1200 mg/kg (Guinea pigs)	> 2000 mg/kg (Rat)	400 ppm (Rabbit)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Eye contact. Skin contact.
Routes of entry	Skin absorption.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Alcohols, C6-12, ethoxylated	No information available	No information available	No information available
Ethoxylated monoethanolamide of fatty acids of coconut oil	No information available	No information available	No information available
2-butoxyethanol	= 2950 mg/L LC50 Lepomis macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 1698 - 1940 mg/L (LC50; Daphnia magna) = 1720 mg/L (EC50; water flea)

12.2 Persistence and degradability

Product is biodegradable. See component information below.

Chemical Name	Persistence and degradability
2-butoxyethanol	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
2-butoxyethanol	Not likely to bioaccumulate

log Pow
<2

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
2-butoxyethanol	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
2-butoxyethanol	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-butoxyethanol
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies

Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	22-Jul-2015
Revision date	06-Feb-2019
Version	8
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID20170
Version 2
Revision date 09-Aug-2018
Supersedes Date: 08-Jul-2016

Safety Data Sheet
SAFE-SURF* EU

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SURF* EU
Product code PID20170

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion fluid additive.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Dermal	Category 4
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H318 - Causes serious eye damage
H332 - Harmful if inhaled

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P310 - Immediately call a POISON CENTER or doctor/physician
P330 - Rinse mouth
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash it before reuse

Contains
2-butoxyethanol

D-Glucopyranose, oligomeric, C8-10 glycosides

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating and toxic gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Water	231-791-2	7732-18-5	30-60
2-butoxyethanol	203-905-0	111-76-2	30-60
D-Glucopyranose, oligomeric, C8-10 glycosides	500-220-1	68515-73-1	5-10

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation Move to fresh air. Keep at rest. If breathing is difficult, (trained personnel should) give oxygen. Seek immediate medical attention/advice.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Seek medical attention at once.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons

None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
2-butoxyethanol	25 ppm TWA 121 mg/m³ TWA	50ppmSTEL 242mg/m³STEL 20ppmTWA 96.9mg/m³TWA	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
2-butoxyethanol	Not determined	25 ppm TWA 121 mg/m³ TWA Skin notation	25 ppm ACL
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2-butoxyethanol	5 mg/m³ MAC	Not determined	25 ppm TWA 121 mg/m³ TWA Possibility of significant uptake through the skin*1)
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2-butoxyethanol	20 ppm TWA 96.7 mg/m³ TWA Skin notation*3)	skin - potential for cutaneous absorption 50 ppm TWA 240 mg/m³ TWA	5 mg/m³ MAC
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2-butoxyethanol	50 ppm TWA	Not determined	50 ppm STEL 246 mg/m³ STEL Skin*2) 20 ppm TWA 98 mg/m³ TWA
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Butyl Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Sweet
Color	Colorless - Light orange
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	3.2	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	~ 16 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.99 s.g	@ 20°C.
Water solubility	Soluble in water	

Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Harmful by inhalation. Inhalation of vapors in high concentration may cause shortness of breath (lung edema).
Eye contact	Causes serious eye damage.
Skin contact	Causes skin irritation. Components of the product may be absorbed into the body through the skin.

Ingestion Harmful if swallowed.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-butoxyethanol	1200 mg/kg (Guinea pigs)	> 2000 mg/kg (Rat)	400 ppm (Rabbit)
D-Glucopyranose, oligomeric, C8-10 glycosides	> 2000 mg/kg bw (Rat) ECHA Data	> 2000 mg/kg (Rabbit) ECHA Data	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Eye contact. Skin contact. Ingestion.

Routes of entry Inhalation. Eye contact. Skin contact. Ingestion.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-butoxyethanol	= 2950 mg/L LC50 Lepomis	No information available	= 1698 - 1940 mg/L (LC50; Daphnia

	macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h		magna) = 1720 mg/L (EC50; water flea)
D-Glucopyranose, oligomeric, C8-10 glycosides	170 mg/l LC50 Zebra fish	37 mg/L (= 21 mg a.i./L) EC50 to the freshwater algae Scenedesmus subspicatus 72h	> 100 mg/l EC50 Daphnia magna 48h

12.2 Persistence and degradability

Readily biodegradable. See component information below.

Chemical Name	Persistence and degradability
2-butoxyethanol	Readily biodegradable
D-Glucopyranose, oligomeric, C8-10 glycosides	OECD 301 Readily biodegradable

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating. See component information below.

Chemical Name	Bioaccumulation
2-butoxyethanol	Not likely to bioaccumulate
D-Glucopyranose, oligomeric, C8-10 glycosides	Not likely to bioaccumulate

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
2-butoxyethanol	Soluble in water
D-Glucopyranose, oligomeric, C8-10 glycosides	Partially soluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
2-butoxyethanol	No information available
D-Glucopyranose, oligomeric, C8-10 glycosides	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-butoxyethanol
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	08-Jul-2016
Revision date	09-Aug-2018
Version	2
This SDS has been revised in the following section(s)	1, 2, 3, 8, 11, 12, 15, 16 Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
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SDS no. PID1410
Version 9
Revision date 19-Mar-2019
Supersedes Date: 11-Feb-2019

Safety Data Sheet
SAFE-SURF* WN

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-SURF* WN
Product code PID1410

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Cleaning agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
D-Glucopyranose, oligomeric, C8-10 glycosides

Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
2-(2-hydroxyethoxy)ethan-1-ol	203-872-2	111-46-6	10 - < 20
D-Glucopyranose, oligomeric, C8-10 glycosides	500-220-1	68515-73-1	5 - < 15
Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*	940-678-3	RM1003733	5 - < 15

Comments
Based on test data - Eye Irritation (OECD 405), this product is not irritant.

*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store at room temperature Avoid frost.

Storage class Chemical storage.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Sulfonation products of disodium	Not determined	Not determined	Not determined

sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*			
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Slight
Color	Colorless - Pale yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Approx. 5	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	~ 100 °C / 212 °F	
Flash point	> 110 °C / > 230 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.04	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	~ 300 cP	@ 20 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	< 0°C / 32°F
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Store at room temperature. Do not freeze.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

LD50 Oral > 2000 mg/kg (rat) Calculated (MIXTURE)

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
D-Glucopyranose, oligomeric, C8-10 glycosides	> 2000 mg/kg bw (Rat) ECHA Data	> 2000 mg/kg (Rabbit) ECHA Data	No data available
Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
D-Glucopyranose, oligomeric, C8-10 glycosides	170 mg/l LC50 Zebra fish	37 mg/L (= 21 mg a.i./L) EC50 to the freshwater algae Scenedesmus subspicatus 72h	> 100 mg/l EC50 Daphnia magna 48h
Sulfonation products of disodium sulfite with (esterification products of C10-16 (even numbered) alkyl polyglycosides with maleic anhydride)*	No information available	No information available	No information available

12.2 Persistence and degradability

Readily biodegradable. See component information below.

Chemical Name	Persistence and degradability
D-Glucopyranose, oligomeric, C8-10 glycosides	OECD 301 Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
D-Glucopyranose, oligomeric, C8-10 glycosides	Not likely to bioaccumulate

12.4 Mobility

Mobility
Soluble in water. See component information below.

Chemical Name	Mobility
D-Glucopyranose, oligomeric, C8-10 glycosides	Partially soluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
D-Glucopyranose, oligomeric, C8-10 glycosides	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated

ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

CAS Number 151911-53-4 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	11-Feb-2019
Revision date	19-Mar-2019
Version	9
This SDS has been revised in the following section(s)	1, 2, 3, 8, 11, 12, 15, 16 There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID1413
Version 2
Revision date 14-Mar-2017
Supersedes Date: 03-Sep-2014

Safety Data Sheet
SAFE-VIS* E

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-VIS* E
Product code PID1413

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion fluid additive. Viscosifier.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Tetradec-1-ene

2.3 Other hazards

This substance does not meet the PBT/vPvB criteria of REACH, annex XIII

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Tetradec-1-ene	214-306-9	1120-36-1	30-60

Comments
The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash contaminated clothing before re-use. Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to

hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values

Component Information

Chemical Name	Arabic	Australia	Egypt
Tetradec-1-ene	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Tetradec-1-ene	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Tetradec-1-ene	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Tetradec-1-ene	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Tetradec-1-ene	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical

hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene Break through time >480 minutes Glove thickness =>0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Very viscous
Odor	Mild
Color	Tan - White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	-20 °C / -4 °F	
Boiling point/range	115.6 °C / 240.0 °F	
Flash point	> 107.2 °C / > 225.0 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.96	15.6 °C
Bulk density	No information available	
Relative density	No information available	

Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	> 20.5 mm2/s	@ 40 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetradec-1-ene	> 10000 mg/kg (Rat)	> 10000 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Skin contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Tetradec-1-ene	= 0.39 mg/L LC50 Oncorhynchus mykiss 96 h = 1.06 mg/L LC50 Pimephales promelas 96 h 1 - 3.2 mg/L LC50 Brachydanio rerio 96 h	22 - 24 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 0.74 mg/L EC50 Daphnia magna 48 h = 0.68 mg/L LC50 Daphnia magna 96 h

	10.0 - 32.0 mg/L LC50 Poecilia reticulata 96 h		

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	03-Sep-2014
Revision date	14-Mar-2017
Version	2
This SDS has been revised in the following section(s)	All sections Product Code change There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	X

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SDS no. PID1415
Version 4
Revision date 06-Sep-2019
Supersedes Date: 25-Sep-2015

Safety Data Sheet
SAFE-VIS* HDE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAFE-VIS* HDE
Product code PID1415
Country Limitations This SDS is not for use in EU/EEA.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier. Completion fluid additive.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P314 - Get medical advice/attention if you feel unwell
P330 - Rinse mouth
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling

Contains
Ethylene Glycol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Ethylene Glycol	203-473-3	107-21-1	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation

develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention if irritation occurs.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Environmental exposure controls
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Ethylene Glycol	Not determined	40ppmSTELvapour	39.4 ppm Ceiling

		104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	100 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethylene Glycol	5 mg/m³ MAC	125 mg/m³ TWA 50.0 ppm TWA 100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile Butyl
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	134 °C / 273 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	< 0.05	
Vapor density	No information available	
Specific gravity	0.88	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization

Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system. May cause additional affects as listed under "Ingestion".

Eye contact May cause eye irritation.

Skin contact Prolonged contact may cause redness and irritation. May be absorbed through the skin in harmful amounts.

Ingestion Harmful if swallowed. May cause damage to organs through prolonged or repeated exposure.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene Glycol	= 7712 mg/kg (Rat) ECHA Data	> 3500 mg/kg (Mouse) ECHA Data	> 2.5 mg/l (Rat) 6 hour ECHA Data

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Ingestion. Skin contact.

Routes of entry Skin absorption.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Kidney.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene Glycol	40000 - 60000 mg/L LC50 (Pimephales promelas) = 96 h 40761 mg/L LC50 (Oncorhynchus mykiss) = 96 h 27540 mg/L LC50 (Lepomis macrochirus) = 96 h 14 - 18 mL/L LC50 (Oncorhynchus mykiss) = 96 h 16000 mg/L LC50 (Poecilia reticulata) = 96 h 41000 mg/L LC50 (Oncorhynchus mykiss) = 96 h	6500 - 13000 mg/L EC50 (Pseudokirchneriella subcapitata) = 96 h	46300 mg/L EC50 (Daphnia magna) = 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Ethylene Glycol	Readily biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Ethylene Glycol	log Pow -1.36(Calculated) Not likely to bioaccumulate

12.4 Mobility

Mobility
Dispersible in water. See component information below.

Chemical Name	Mobility
Ethylene Glycol	Completely soluble

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Ethylene Glycol	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated

ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol
Schedule 6
Schedule 5

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in EU/EEA.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	25-Sep-2015
Revision date	06-Sep-2019
Version	4
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	J

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SDS no. PID1436
Version 2
Revision date 06-Jul-2017
Supersedes Date: 11-Jun-2014

Safety Data Sheet
SAPP

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SAPP
Product code PID1436

Molecular weight 222.15

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use SAPP dispersant. Thinner.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Disodium dihydrogen diphosphate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Disodium dihydrogen diphosphate	231-835-0	7758-16-9	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Oxides of phosphorus.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Protect from moisture Avoid contact with: Strong alkalies.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined

Chemical Name	Malaysia	Philippines	Russia
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene PVC Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Crystalline Powder
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	4.0 - 5.0	@ 10 g/l
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	

Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.8 - 1.9 sg	20 °C
Bulk density	1000-1200 kg/m³	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	222.15
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Strong alkalies.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

Eye contact Causes serious eye irritation.

Skin contact Prolonged skin contact may cause skin irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Disodium dihydrogen diphosphate	= 1800 mg/kg (Rat)	No data available	> 0.58 mg/L (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Disodium dihydrogen diphosphate	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR002503
Group number	6.4A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	11-Jun-2014
Revision date	06-Jul-2017
Version	2
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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Safety Data Sheet

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Document group:	16-2219-0	**Version number:**	4.00
Issue Date:	27/09/2017	**Supersedes date:**	06/10/2014

This Safety Data Sheet has been prepared in accordance with the Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice (Safe Work Australia, December 2011)

SECTION 1: Identification

1.1. Product identifier
3M™ Glass Bubbles HGS750, HGS2000, HGS3000, HGS4000, HGS5000, HGS6000, HGS8000X, HGS10000, HGS18000, HGS4K28, HGS19K46

Product Identification Numbers

98-0212-2986-3	98-0212-2988-9	98-0212-3010-1	98-0212-3011-9	98-0212-3012-7
98-0212-3014-3	98-0212-3015-0	98-0212-3016-8	98-0212-3018-4	98-0212-3038-2
98-0212-3086-1	98-0212-3302-2	98-0212-3523-3	WF-6009-1424-7	WF-6009-1425-4

1.2. Recommended use and restrictions on use

Recommended use
Downhole Oil and Gas Applications, Industrial use.

For Industrial or Professional use only.

1.3. Supplier's details
Address: 3M Australia - Building A, 1 Rivett Road, North Ryde NSW 2113
Telephone: 136 136
E Mail: productinfo.au@mmm.com
Website: www.3m.com.au

1.4. Emergency telephone number
EMERGENCY: 1800 097 146 (Australia only)

SECTION 2: Hazard identification

This product is NOT classified as a hazardous chemical according to the Model Work Health and Safety Regulations, 2011, in accordance with applicable State and Territory legislation.

Refer to Section 14 of this Safety Data Sheets for product Dangerous Goods Classification.

2.1. Classification of the substance or mixture
Not applicable.

2.2. Label elements

Signal word
Not applicable.

Symbols
Not applicable.

Pictograms
Not applicable.

2.3. Other assigned/identified product hazards
None known.

2.4. Other hazards which do not result in classification
May be harmful if swallowed.

SECTION 3: Composition/information on ingredients

This material is a mixture.

Ingredient	CAS Nbr	% by Weight
SODA LIME BOROSILICATE GLASS	65997-17-3	97 - 100

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation
Remove person to fresh air. If you feel unwell, get medical attention.

Skin contact
Wash with soap and water. If signs/symptoms develop, get medical attention.

Eye contact
Flush with large amounts of water. Remove contact lenses if easy to do. Continue rinsing. If signs/symptoms persist, get medical attention.

If swallowed
Rinse mouth. If you feel unwell, get medical attention.

4.2. Most important symptoms and effects, both acute and delayed
See Section 11.1. Information on toxicological effects.

4.3. Indication of any immediate medical attention and special treatment required
Not applicable

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media
Material will not burn. Use a fire fighting agent suitable for the surrounding fire.

5.2. Special hazards arising from the substance or mixture
None inherent in this product.

5.3. Special protective actions for fire-fighters
No special protective actions for fire-fighters are anticipated.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Evacuate area. Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice. Refer to other sections of this SDS for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment.

6.2. Environmental precautions
Avoid release to the environment.

6.3. Methods and material for containment and cleaning up
Collect as much of the spilled material as possible. Use wet sweeping compound or water to avoid dusting. Sweep up. Place in a closed container approved for transportation by appropriate authorities. Clean up residue. Seal the container. Dispose of collected material as soon as possible in accordance with applicable local/regional/national/international regulations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
For industrial or professional use only. Avoid breathing dust/fume/gas/mist/vapours/spray. Do not eat, drink or smoke when using this product. Wash thoroughly after handling.

7.2. Conditions for safe storage including any incompatibilities
No special storage requirements.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits
If a component is disclosed in section 3 but does not appear in the table below, an occupational exposure limit is not available for the component.

Ingredient	CAS Nbr	Agency	Limit type	Additional comments
Glass filaments	65997-17-3	Australia OELs	TWA(8 hours):0.5 fibers/ml;TWA(as fiber)(8 hours):0.5 fibers/ml	
SODA LIME BOROSILICATE GLASS	65997-17-3	Manufacturer determined	TWA(as dust):10 mg/m3	

ACGIH : American Conference of Governmental Industrial Hygienists
AIHA : American Industrial Hygiene Association
Australia OELs : Australia. Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment
CMRG : Chemical Manufacturer's Recommended Guidelines
TWA: Time-Weighted-Average
STEL: Short Term Exposure Limit
CEIL: Ceiling
Sen: Sensitiser
Sk: Absorption through the skin may be a significant source of exposure.

8.2. Exposure controls

8.2.1. Engineering controls
Provide appropriate local exhaust ventilation at transfer points. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below relevant Exposure Limits and/or control dust/fume/gas/mist/vapours/spray.

If ventilation is not adequate, use respiratory protection equipment.

8.2.2. Personal protective equipment (PPE)

Eye/face protection

Select and use eye/face protection to prevent contact based on the results of an exposure assessment. The following eye/face protection(s) are recommended:
Safety glasses with side shields.

Select and use eye protection in accordance with AS/NZS 1336. Eye protection should comply with the performance specifications of AS/NZS 1337.

Skin/hand protection
No chemical protective gloves are required.

Respiratory protection

Wear respiratory protection if ventilation is inadequate to prevent overexposure. An exposure assessment may be needed to decide if a respirator is required. If a respirator is needed, use respirators as part of a full respiratory protection program. Based on the results of the exposure assessment, select from the following respirator type(s) to reduce inhalation exposure:
Half facepiece or full facepiece air-purifying respirator suitable for particulates.

For questions about suitability for a specific application, consult with your respirator manufacturer.
Select and use respirators according to AS/NZS 1715. Respirators should comply with AS/NZS 1716 performance specifications. For information about respirators, call 3M on 1800 024 464.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid.
Specific Physical Form:	Fine Powder < 100 microns
Appearance/Odour	White, Odourless
Odour threshold	*Not applicable.*
Melting point/Freezing point	*No data available.*
Boiling point/Initial boiling point/Boiling range	*Not applicable.*
Flash point	*Not applicable.*
Evaporation rate	*Not applicable.*
Flammability (solid, gas)	Not classified
Flammable Limits(LEL)	*Not applicable.*
Flammable Limits(UEL)	*Not applicable.*
Vapour pressure	*Not applicable.*
Vapour density	*Not applicable.*
Density	0.1 - 0.6 g/cm3
Relative density	0.1 - 0.6 [*Ref Std:*WATER=1]
Water solubility	Negligible
Solubility- non-water	*Not applicable.*
Partition coefficient: n-octanol/water	*No data available.*
Autoignition temperature	*Not applicable.*
Decomposition temperature	*Not applicable.*
Viscosity	*Not applicable.*
Molecular weight	*No data available.*
Volatile organic compounds (VOC)	*Not applicable.*
Percent volatile	< 0.5 % weight

Softening point	>=600 ºC
VOC less H2O & exempt solvents	*Not applicable.*

SECTION 10: Stability and reactivity

10.1 Reactivity
This material is considered to be non reactive under normal use conditions

10.2 Chemical stability
Stable.

10.3. Conditions to avoid
None known.

10.4. Possibility of hazardous reactions
Hazardous polymerisation will not occur.

10.5 Incompatible materials
None known.

10.6 Hazardous decomposition products

Substance	**Condition**
Oxides of sulphur.	If Breakage Occurs

SECTION 11: Toxicological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. In addition, toxicological data on ingredients may not be reflected in the material classification and/or the signs and symptoms of exposure, because an ingredient may be present below the threshold for labelling, an ingredient may not be available for exposure, or the data may not be relevant to the material as a whole.

11.1 Information on Toxicological effects

Signs and Symptoms of Exposure

Based on test data and/or information on the components, this material may produce the following health effects:

Inhalation
Respiratory tract irritation: Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Skin contact
Mechanical skin irritation: Signs/symptoms may include abrasion, redness, pain, and itching.

Eye contact
Mechanical eye irritation: Signs/symptoms may include pain, redness, tearing and corneal abrasion.

Ingestion
May be harmful if swallowed.
Gastrointestinal irritation: Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhoea.

Toxicological Data

If a component is disclosed in section 3 but does not appear in a table below, either no data are available for that endpoint or the data are not sufficient for classification.

Acute Toxicity

Name	Route	Species	Value
Overall product	Ingestion		No data available; calculated ATE2,000 - 5,000 mg/kg
SODA LIME BOROSILICATE GLASS	Dermal		LD50 estimated to be > 5,000 mg/kg
SODA LIME BOROSILICATE GLASS	Ingestion		LD50 estimated to be 2,000 - 5,000 mg/kg

ATE = acute toxicity estimate

Skin Corrosion/Irritation

Name	Species	Value
SODA LIME BOROSILICATE GLASS	Professional judgement	No significant irritation

Serious Eye Damage/Irritation

Name	Species	Value
SODA LIME BOROSILICATE GLASS	Professional judgement	No significant irritation

Skin Sensitisation

For the component/components, either no data are currently available or the data are not sufficient for classification.

Respiratory Sensitisation

For the component/components, either no data are currently available or the data are not sufficient for classification.

Germ Cell Mutagenicity

Name	Route	Value
SODA LIME BOROSILICATE GLASS	In Vitro	Some positive data exist, but the data are not sufficient for classification

Carcinogenicity

Name	Route	Species	Value
SODA LIME BOROSILICATE GLASS	Inhalation	Multiple animal species	Some positive data exist, but the data are not sufficient for classification

Reproductive Toxicity

Reproductive and/or Developmental Effects

For the component/components, either no data are currently available or the data are not sufficient for classification.

Target Organ(s)

Specific Target Organ Toxicity - single exposure

For the component/components, either no data are currently available or the data are not sufficient for classification.

Specific Target Organ Toxicity - repeated exposure

Name	Route	Target Organ(s)	Value	Species	Test result	Exposure Duration
SODA LIME BOROSILICATE GLASS	Inhalation	respiratory system	Not classified	Human	NOAEL not available	occupational exposure

Aspiration Hazard
For the component/components, either no data are currently available or the data are not sufficient for classification.

Exposure Levels
Refer Section **8.1 Control Parameters** of this Safety Data Sheet.

Interactive Effects
Not determined.

SECTION 12: Ecological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. Additional information leading to material classification in Section 2 is available upon request. In addition, environmental fate and effects data on ingredients may not be reflected in this section because an ingredient is present below the threshold for labelling, an ingredient is not expected to be available for exposure, or the data is considered not relevant to the material as a whole.

12.1. Toxicity

Acute aquatic hazard:
Not acutely toxic to aquatic life by GHS criteria.

Chronic aquatic hazard:
Not chronically toxic to aquatic life by GHS criteria.

No product test data available.

Material	CAS Number	Organism	Type	Exposure	Test endpoint	Test result
SODA LIME BOROSILICATE GLASS	65997-17-3	Green algae	Experimental	72 hours	EC50	>1,000 mg/l
SODA LIME BOROSILICATE GLASS	65997-17-3	Water flea	Experimental	72 hours	EC50	>1,000 mg/l
SODA LIME BOROSILICATE GLASS	65997-17-3	Zebra Fish	Experimental	96 hours	LC50	>1,000 mg/l
SODA LIME BOROSILICATE GLASS	65997-17-3	Green algae	Experimental	72 hours	NOEC	>=1,000 mg/l

12.2. Persistence and degradability

Material	CAS Number	Test type	Duration	Study Type	Test result	Protocol
SODA LIME BOROSILICATE GLASS	65997-17-3	Data not available or insufficient for classification	N/A	N/A	N/A	N/A

12.3 : Bioaccumulative potential

Material	CAS Number	Test type	Duration	Study Type	Test result	Protocol
SODA LIME BOROSILICATE GLASS	65997-17-3	Data not available or insufficient for	N/A	N/A	N/A	N/A

		classification				

12.4. Mobility in soil
Please contact manufacturer for more details

12.5 Other adverse effects
No information available.

SECTION 13: Disposal considerations

13.1. Disposal methods
Dispose of contents/ container in accordance with the local/regional/national/international regulations.

Incinerate in a permitted waste incineration facility.

SECTION 14: Transport Information

Australian Dangerous Goods Code (ADG) - Road/Rail Transport
UN No.: Not applicable.
Proper shipping name: Not applicable.
Class/Division: Not applicable.
Sub Risk: Not applicable.
Packing Group: Not applicable.

Hazchem Code: Not applicable
IERG: Not applicable.

International Air Transport Association (IATA) - Air Transport
UN No.: Not applicable.
Proper shipping name: Not applicable.
Class/Division: Not applicable.
Sub Risk: Not applicable.
Packing Group: Not applicable.

International Maritime Dangerous Goods Code (IMDG)- Marine Transport
UN No.: Not applicable.
Proper shipping name: Not applicable.
Class/Division: Not applicable.
Sub Risk: Not applicable.
Packing Group: Not applicable.
Marine Pollutant: Not applicable.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Australian Inventory Status:
This product is defined as an article under the Industrial Chemicals (Notification and Assessment) Act 1989, as amended, and is exempt from inventory requirements under the Industrial Chemicals (Notification and Assessment) Act 1989 as amended.

Poison Schedule: This product is an article therefore the Standard for the Uniform Scheduling of Medicines and Poisons Schedule is not applicable.

SECTION 16: Other information

Revision information:
Update to product identification numbers.

DISCLAIMER: The information on this Safety Data Sheet is based on our experience and is correct to the best of our knowledge at the date of publication, but we do not accept any liability for any loss, damage or injury resulting from its use (except as required by law). The information may not be valid for any use not referred to in this Safety Data Sheet or use of the product in combination with other materials. For these reasons, it is important that customers carry out their own test to satisfy themselves as to the suitability of the product for their own intended applications.
Greenguard ® is a United States based program. The 'Low VOC' reference related to United States Federal and State regulations exemptions for some solvents.

3M Australia SDSs are available at www.3m.com.au

SDS no. D066
Version 3
Revision date 02-Mar-2020
Supersedes Date: 13-Jul-2017

Safety Data Sheet
Silica Flour D66

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Silica Flour D66
Product code D066

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Malaysian	Local emergency number; +603 2161 7655

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Quartz, Crystalline silica

Respirable Crystalline Silica (Quartz)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Quartz, Crystalline silica	238-878-4	14808-60-7	60-100
Respirable Crystalline Silica (Quartz)	238-878-4	14808-60-7	<10

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
React with hydrofluoric acid (HF) forming toxic gas (SiF4).

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Hydrofluoric acid (HF) Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Quartz, Crystalline silica	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Respirable Crystalline Silica (Quartz)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Quartz, Crystalline silica	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Respirable Crystalline Silica (Quartz)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Quartz, Crystalline silica	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen

Respirable Crystalline Silica (Quartz)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Quartz, Crystalline silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Respirable Crystalline Silica (Quartz)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Quartz, Crystalline silica	0.025 mg/m³ TWA	Not determined	Not determined
Respirable Crystalline Silica (Quartz)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene gloves Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Solid
Appearance Powder
Odor Odorless
Color Tan or White

Odor threshold Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	> 1700 °C / 3092 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.50 - 2.70	@20 °C
Bulk density	1100- 1600 kg/m^3	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Not applicable
Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) No information available
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None known.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause respiratory irritation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Quartz, Crystalline silica	No data available	No data available	No data available
Respirable Crystalline Silica (Quartz)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Quartz, Crystalline silica	No information available	No information available	No information available
Respirable Crystalline Silica (Quartz)	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Quartz, Crystalline silica	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Quartz, Crystalline silica	Product/Substance is inorganic

12.4 Mobility

Mobility
The product is insoluble and sinks in water.

Chemical Name	Mobility
Quartz, Crystalline silica	Insoluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Quartz, Crystalline silica	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	13-Jul-2017
Revision date	02-Mar-2020
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D075
Version 4
Revision date 19-Sep-2018
Supersedes Date: 09-Apr-2014

Safety Data Sheet
Silicate Additive D75

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Silicate Additive D75
Product code D075

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Thermal decomposition can lead to release of toxic and corrosive gases/vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep at temperatures above > 32F /0°C Avoid contact with: Strong acids Metals Aluminum Zinc Steel
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.
Packaging materials to be avoided	Metal Aluminium Zinc Steel

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: PVC Rubber Neoprene Nitrile Break through time >480 minutes Glove thickness >0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	11	
pH @ dilution	No information available	
Melting / freezing point	- 1 °C / 30 °F	
Boiling point/range	101 °C / 214 °F	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	<1 kPa	
Vapor density	No information available	
Specific gravity	1.3 - 1.6	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	10-10000 mPa s	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Contact with metals may evolve flammable hydrogen gas.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep at temperatures above > 32°F / 0°C.

10.5 Incompatible materials

Aluminum. Zinc. Metals. Strong acids. Steel.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact.

Routes of entry	None known.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	09-Apr-2014
Revision date	19-Sep-2018
Version	4
This SDS has been revised in the following section(s)	15, 16 There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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SDS no. M003
Version 5
Revision date 18-Sep-2018
Supersedes Date: 10-Apr-2017

Safety Data Sheet
Soda Ash M3

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Soda Ash M3
Product code M003

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Buffer in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2A

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves and eye/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Sodium carbonate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Sodium carbonate	207-838-8	497-19-8	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Avoid dust formation.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with water and moist air - product is hygroscopic. Store away from incompatibles, Powdered aluminum Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	**Arabic**	**Australia**	**Egypt**
Sodium carbonate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium carbonate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium carbonate	2 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium carbonate	Not determined	Not determined	Skin notation Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium carbonate	Not determined	Not determined	Not determined

Notes

No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Nitrile PVA Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	11	
pH @ dilution	No information available	
Melting / freezing point	851 °C / 1564 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	

Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	2.5	@20 °C
Bulk density	No information available	
Relative density	2.53	@ 20°C.
Water solubility	212.5g/L	@ 20 °C
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	>400°C/ 752°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Decomposes by reaction with strong acids.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid contact with water and moist air - product is hygroscopic.

10.5 Incompatible materials

Powdered aluminum. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and

cough.

Eye contact Causes serious eye irritation. May cause pain, redness, discomfort.

Skin contact May cause skin irritation and/or dermatitis.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	= 4090 mg/kg (Rat)	No data available	= 2300 mg/m³ (Rat) 2 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium carbonate	310 - 1220 mg/L LC50 Pimephales promelas 96 h = 300 mg/L LC50 Lepomis macrochirus 96 h	= 242 mg/L EC50 Nitzschia 120 h	= 265 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies

New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	10-Apr-2017
Revision date	18-Sep-2018
Version	5
This SDS has been revised in the following section(s)	1, 2, 7, 8, 15, 16 Updated according to GHS/CLP. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID1490
Version 6
Revision date 31-Jan-2019
Supersedes Date: 17-Jun-2015

Safety Data Sheet
SODIUM BROMIDE BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SODIUM BROMIDE BRINE
Product code PID1490

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Clear-brine workover and completion fluid.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium bromide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of irritating gases and vapors

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium bromide	231-599-9	7647-15-6	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Bromine, bromine oxides and hydrogen bromide, Sodium oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Acids Metals Bromine trifluoride.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium bromide	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium bromide	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium bromide	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium bromide	Not determined	Not determined	3 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium bromide	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene PVC Break through time >240 minutes Glove thickness =0.10 - 0.20 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Odorless
Color	Clear
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	5.74 - 5.75	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	

Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.078 - 1.508	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	~ 800 °C / ~1472°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Acids. Heavy metals. Bromine trifluoride.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium bromide	= 3500 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other

			aquatic invertebrates
Sodium bromide	0.054 - 0.081 mg/L LC50 Oncorhynchus mykiss 96 h > 1000 mg/L LC50 Lepomis macrochirus 96 h 15614 - 17428 mg/L LC50 Pimephales promelas 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h > 1000 mg/L LC50 Oncorhynchus mykiss 96 h = 24000 mg/L LC50 Oryzias latipes 96 h 24000 - 96000 mg/L LC50 Oryzias latipes 96 h 16000 - 24000 mg/L LC50 Poecilia reticulata 96 h	5800 - 24000 mg/L EC50 Scenedesmus pannonicus 96 h	5700 - 10800 mg/L EC50 Daphnia magna 48 h 5800 - 48000 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Y. Proper Shipping Name: Sodium bromide solution (50% or less)

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium bromide
Schedule 4

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	17-Jun-2015
Revision date	31-Jan-2019
Version	6
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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SDS no. PID1103
Version 6
Revision date 04-Aug-2020
Supersedes Date: 03-Apr-2017

Safety Data Sheet
SODIUM CHLORIDE BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SODIUM CHLORIDE BRINE
Product code PID1103

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Weighting agent. Completion brine.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium Chloride

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium Chloride	231-598-3	7647-14-5	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Oxides of:, Sodium, Chlorides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium Chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium Chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium Chloride	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium Chloride	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium Chloride	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical

hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl PVC Break through time >480 minutes Glove thickness =>0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	8.5	
pH @ dilution	No information available	
Melting / freezing point	-5 °C / 23 °F	
Boiling point/range	106 °C / 222.8 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	

Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.008 - 1.200 g/cm³	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium Chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium Chloride	4747 - 7824 mg/L LC50	No information available	340.7 - 469.2 mg/L EC50 Daphnia

	Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h		magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z.
Proper Shipping Name: Drilling brines, including: calcium bromide solution, calcium chloride solution and sodium chloride solution.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	03-Apr-2017
Revision date	04-Aug-2020
Version	6
This SDS has been revised in the following section(s)	1, 2, 7, 8, 12, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	0
Physical hazard	0
PPE	B

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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SDS no. PID1104
Version 3
Revision date 04-Apr-2018
Supersedes Date: 03-Feb-2015

Safety Data Sheet
SODIUM CHLORIDE/SODIUM BROMIDE BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SODIUM CHLORIDE/SODIUM BROMIDE BRINE
Product code PID1104

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Completion brine.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium bromide

Sodium chloride

2.3 Other hazards

Thermal decomposition can lead to release of irritating gases and vapors
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium bromide	231-599-9	7647-15-6	30-60
Sodium chloride	231-598-3	7647-14-5	10-30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Seek medical attention if irritation occurs.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the

length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Bromine, bromine oxides and hydrogen bromide, Chlorine, Sodium oxides, Chlorides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place.

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium bromide	Not determined	Not determined	Not determined
Sodium chloride	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium bromide	Not determined	Not determined	Not determined
Sodium chloride	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium bromide	Not determined	Not determined	Not determined
Sodium chloride	5 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium bromide	Not determined	Not determined	3 mg/m³ MAC
Sodium chloride	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium bromide	Not determined	Not determined	Not determined
Sodium chloride	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl PVC Break through time >480 minutes Glove thickness >=0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Odorless
Color	Clear
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	

Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.0 - 1.6	25 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium bromide	= 3500 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	No data available
Sodium chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium bromide	0.054 - 0.081 mg/L LC50 Oncorhynchus mykiss 96 h > 1000 mg/L LC50 Lepomis macrochirus 96 h 15614 - 17428 mg/L LC50 Pimephales promelas 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h > 1000 mg/L LC50 Oncorhynchus mykiss 96 h = 24000 mg/L LC50 Oryzias latipes 96 h 24000 - 96000 mg/L LC50 Oryzias latipes 96 h 16000 - 24000 mg/L LC50 Poecilia reticulata 96 h	5800 - 24000 mg/L EC50 Scenedesmus pannonicus 96 h	5700 - 10800 mg/L EC50 Daphnia magna 48 h 5800 - 48000 mg/L EC50 Daphnia magna 48 h
Sodium chloride	= 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h 4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z.
Proper Shipping Name: Drilling brines, including: calcium bromide solution, calcium chloride solution and sodium chloride solution.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium bromide
Schedule 4
New Zealand

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	03-Feb-2015
Revision date	04-Apr-2018
Version	3
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood Follow general hygiene considerations recognized as common good workplace practices

Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID1505
Version 3
Revision date 18-Jun-2020
Supersedes Date: 02-Sep-2016

Safety Data Sheet
SODIUM FORMATE BRINE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SODIUM FORMATE BRINE
Product code PID1505

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Weighting agent. Completion brine.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Sodium formate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium formate	205-488-0	141-53-7	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sodium.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium formate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium formate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium formate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium formate	Not determined	Not determined	10 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium formate	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Provide eyewash station.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Odorless
Color	Clear
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	8.6	10 % solution
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.99 - 1.318	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	

Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	29 cP (40 wt% solution)
log Pow	No information available

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from sources of ignition - No smoking.

10.5 Incompatible materials

Strong acids. Formic acid may be formed.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium formate	= 11200 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Listed on PLONOR list of OSPAR

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium formate	= 5000 mg/L LC50 Lepomis macrochirus 24 h	No information available	> 1000 mg/L EC50 Daphnia magna 24 h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated

ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification Not classified

HSNO approval no. Not required.

Group number Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA) Complies
Canada (DSL) Complies
Philippines (PICCS) Complies
Japan (ENCS) Complies
China (IECSC) Complies

Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	02-Sep-2016
Revision date	18-Jun-2020
Version	3
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID15038A
Version 10
Revision date 29-Nov-2018
Supersedes Date: 20-Jun-2018

Safety Data Sheet
SODIUM HYDROXIDE

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SODIUM HYDROXIDE
Product code PID15038A

Synonyms CAUSTIC SODA, SODIUM HYDROXIDE PRILLS
Molecular weight 49.99 g/mol

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use pH modifier

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1A
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse
P390 - Absorb spillage to prevent material damage
P406 - Store in corrosive resistant stainless steel container with a resistant inner liner

Contains
Sodium hydroxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Contact with metals may evolve flammable hydrogen gas
The product reacts with water and will generate heat.

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Sodium hydroxide	215-185-5	1310-73-2	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas. The product reacts with water and will generate heat.

Hazardous combustion products
Thermal decomposition can lead to release of toxic and corrosive gases/vapors Sodium oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Keep people away from and upwind of spill/leak. Do not get on skin or clothing. Wash thoroughly after handling. Avoid dust formation. Do not breathe dust. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. Flush area with flooding quantities of water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid dust formation. Do not breathe dust. Avoid spills and splashing during use. Reacts violently with water.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture

Reacts violently with water Store in original container. Avoid contact with: Metals Acids

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium hydroxide	Not determined	2 mg/m³ Peak	2 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ Ceiling	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ TWA	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium hydroxide	2 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against powders and dusts
Chemical splash goggles and/or face shield

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders
Impervious gloves made of: Nitrile Rubber PVC
Break through time >480 minutes
Glove thickness 0.5 mm
Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Pellets
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	14.0	@ 5%
Melting / freezing point	318 °C / 604.4 °F	
Boiling point/range	1390 °C / 2534 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	3.5 hPa	@ 800 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	1.1-1.25 g/cm3	
Relative density	2.13 g/cm3	@ 25°C.
Water solubility	Completely soluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	Not applicable

9.2 Other information

Pour point	No information available
Molecular weight	49.99 g/mol
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive. Corrosive to Metals. Contact with metals may evolve flammable hydrogen gas. Reacts violently with water.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Do not add water directly to the product. It may cause a violent reaction. Avoid dust formation.

10.5 Incompatible materials

Acids. Metals. Water.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhaled corrosive substances can lead to a toxic edema of the lungs. Contact with moist mucous membranes of the respiratory system can cause burns and lung damage. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

Eye contact Causes serious eye damage.

Skin contact Causes burns.

Ingestion Causes burns. Can burn mouth, throat, and stomach.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	No data available	1350 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Ingestion. Skin contact. Eye contact.
Routes of entry	Skin contact. Eye contact. Ingestion. Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Sodium hydroxide	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Sodium hydroxide	Product/Substance is inorganic

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Sodium hydroxide	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Sodium hydroxide	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN1823
UN No. (IMDG/ANTAQ) UN1823
UN No. (ICAO/ANAC) UN1823

14.2. UN proper shipping name
SODIUM HYDROXIDE, SOLID,

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class 8
IMDG/ANTAQ Hazard class 8
ICAO/ANAC Hazard class/division 8

14.4 Packing group
ADR/RID/ADN/ADG Packing group II
IMDG/ANTAQ Packing group II
ICAO/ANAC Packing group II

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2W
Tunnel restriction code	(E)

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium hydroxide
Schedule 6
Schedule 5

New Zealand Hazard Classification	Classified
HSNO approval no.	HSR001547
Group number	n/a

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	20-Jun-2018
Revision date	29-Nov-2018
Version	10
This SDS has been revised in the following section(s)	1, 7, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID1524
Version 6
Revision date 18-Jun-2018
Supersedes Date: 13-Sep-2015

Safety Data Sheet
SP-101*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SP-101*
Product code PID1524

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Fluid loss reducer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Suspended dust may present a dust explosion hazard
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes extremely slippery when wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up

Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes extremely slippery when wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Suspended dust may present a dust explosion hazard Protect from moisture Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents Strong acids
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene PVC Frequent change is advisable

Respiratory protection No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules Dust
Odor	Slight
Color	Off-white - Cream
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	7	@1%
Melting / freezing point	> 150 °C / > 302 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	20 °C
Bulk density	392 kg/m³ / 24.5 lb/ft³	
Relative density	0.2 - 0.9	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150° / 302°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	<0	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
Oxidizing agents may cause exothermic reactions.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

LD50 Oral	> 5000 mg/kg (rat) estimated (MIXTURE)
LD50 Dermal	> 5000 mg/kg (rat) estimated (MIXTURE)

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
IC50/Algae/72 hrs. : > 100 mg/L (Estimated) (MIXTURE).

Toxicity to fish
LC50/Oncorhynchus mykiss/96 hrs. : > 100 mg/L (Estimated) (MIXTURE).

Toxicity to daphnia and other aquatic invertebrates
EC50/Daphina/48 hrs. : > 100 mg/L (Estimated) (MIXTURE).

12.2 Persistence and degradability

Not readily biodegradable.

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

log Pow
<0

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	13-Sep-2015
Revision date	18-Jun-2018

Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood
Follow general hygiene considerations recognized as common good workplace practices

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SDS no. D259
Version 2
Revision date 12-Jul-2019
Supersedes Date: 21-Nov-2016

Safety Data Sheet
Spacer Additive D259

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Spacer Additive D259
Product code D259

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Harmful organic chemical fumes.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover with plastic sheet to prevent spreading.

Methods for cleaning up
Avoid dust formation. Take up mechanically and collect in suitable container for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Protect from moisture Keep at < 122 °F/ 50°C Do not store and transport with oxidizers, acids and bases.
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Nitrile Neoprene gloves Frequent change is advisable
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash

contaminated clothing before re-use

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Fibrous
Odor	Sweet
Color	White or Light yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	Not applicable	
Melting / freezing point	215 - 225 °C / 419 - 437 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	1.2 - 1.3	@ 20 °C
Bulk density	No information available	
Relative density	1.2-1.3	@ 25°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	388 °C / 730 °F	
Decomposition temperature	> 230 °C / >446 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid contact with heat, sparks, open flame, and static discharge. Keep away from direct sunlight. Keep at <50°C / 122°F°C. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents. Acids. Bases.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Repeated exposure may cause skin dryness or cracking.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation. Skin contact. Eye contact.

Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Inherently biodegradable.

12.3 Bioaccumulative potential

Product has a low potential to bioconcentrate.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Exempt
Philippines (PICCS)	Exempt
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Exempt
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	21-Nov-2016
Revision date	12-Jul-2019
Version	2
This SDS has been revised in the following section(s)	8. EXPOSURE CONTROLS / PERSONAL PROTECTION 15. Regulatory Information No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D231
Version 4
Revision date 20-Aug-2018
Supersedes Date: 26-Nov-2014

Safety Data Sheet
Spacer Solvent D231

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Spacer Solvent D231
Product code D231

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves and eye/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
2,2-dimethyl-1,3-dioxolan-4-ylmethanol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Combustible liquid
Vapors are heavier than air and may spread along floors

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	202-888-7	100-79-8	60 - 100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Dry chemical, CO_2, alcohol-resistant foam or water spray, Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Combustible material.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Avoid contact with eyes. Keep away from heat, sparks, and flame. Remove all sources of ignition. Ensure adequate ventilation.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. All equipment used when handling the product must be grounded.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Ensure all equipment is electrically grounded before beginning transfer operations.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Keep away from open flames, hot surfaces and sources of ignition Avoid excessive heat for prolonged periods of time. Avoid frost. Avoid contact with: Strong oxidizing agents Strong reducing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only. Steel or high density polyethylene (HDPE) container

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values

Component Information

Chemical Name	Arabic	Australia	Egypt
2,2-dimethyl-1,3-dioxolan-4-ylmetha	Not determined	Not determined	Not determined

nol			
Chemical Name	**India**	**Indonesian**	**Japan**
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Wear chemical resistant gloves such as nitrile or neoprene.
Break through time >480 minutes
Glove thickness 0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141)

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid

Appearance	Oily
Odor	Pleasant
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	-99 °C/ -146 °F	
Boiling point/range	189 - 191 °C/ 373 - 376 °F	
Flash point	91 °C/ 196 °F	
Evaporation rate (BuAc =1)	= 0.03	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	0.05 hPa (@ 20°C)	
Vapor density	2.6 (air = 1)	
Specific gravity	1.059 - 1.079	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Completely soluble	
Solubility in other solvents	Soluble in hydrocarbons	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	11 mPas @ 20 °C	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product. Combustible liquid.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Keep away from direct sunlight. Keep away from open flames, hot surfaces and sources of ignition. Avoid excessive heat for prolonged periods of time. Avoid frost.

10.5 Incompatible materials

Strong oxidizing agents. Strong reducing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	= 7 g/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing. Not classified.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact. Inhalation. Skin contact.

Routes of entry Eye contact. Inhalation. Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Ecotoxicity effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	15200 - 18300 mg/L LC50 Pimephales promelas 96 h	72 h - ErC50 > 92 mg/L	48 hr EC50: > 96 mg/L

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	Inherently biodegradable OECD (302B)

12.3 Bioaccumulative potential

Product has a low potential to bioconcentrate.

Chemical Name	Bioaccumulation
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	log Kow <=3

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Chemical Name	Mobility
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	172 mg/ml@20 °C

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
2,2-dimethyl-1,3-dioxolan-4-ylmethanol	Log Koc: < 1.25

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	26-Nov-2014
Revision date	20-Aug-2018
Version	4
This SDS has been revised in the following section(s)	All sections Updated according to GHS/CLP. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	2
Physical hazard	0
PPE	C

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SDS no. D241A
Version 2
Revision date 27-Aug-2018
Supersedes Date: 30-Jun-2014

Safety Data Sheet
Spacer Solvent D241A

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Spacer Solvent D241A
Product code D241A

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Cleaning agent

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Aspiration toxicity	Category 1
Serious eye damage/eye irritation	Category 1

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H304 - May be fatal if swallowed and enters airways
H318 - Causes serious eye damage
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P331 - Do NOT induce vomiting
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*

Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*

Alcohols, C9-11-iso-, C10-rich

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	926-141-6	RM1004246	60-100
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	931-329-6	RM1002627	5-<10
Alcohols, C9-11-iso-, C10-rich	271-234-0	68526-85-2	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.
*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of

this SDS.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. If conscious, drink plenty of water. Never give anything by mouth to an unconscious person. Risk of product entering the lungs on vomiting after ingestion. Seek medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded Avoid heat, flames and other sources of ignition. Incompatible with oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only. Steel or high density polyethylene (HDPE) container

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics OEL vapour (Total Hydrocarbons/RCP) – TWA 1200mg/m³ (165ppm)
Above Occupational Exposure Limit (OEL) is a “in-house” calculated value provided from Suppliers of this component and calculated as per CEFIC/HSPA/UK EH 40 guidelines.

Component Information

Chemical Name	Arabic	Australia	Egypt
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Not determined	Not determined	Not determined
Alcohols, C9-11-iso-, C10-rich	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Not determined	Not determined	Not determined
Alcohols, C9-11-iso-, C10-rich	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Not determined	Not determined	Not determined
Alcohols, C9-11-iso-, C10-rich	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Not determined	Not determined	Not determined
Alcohols, C9-11-iso-, C10-rich	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Not determined	Not determined	Not determined
Alcohols, C9-11-iso-, C10-rich	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Chemical splash goggles and/or face shield
Hand protection	Wear gloves according to EN 374 resistant to the solvent(s) in use Use protective gloves made of: Nitrile Break through time >480 minutes Glove thickness 0.38 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with combination filter for vapour/particulate (EN 141) Type A/P3. At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	None
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	< -20 °C / -4 °F	
Boiling point/range	> 200 °C / 392 °F	
Flash point	65 °C / 149 °F	Seta closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	

Decomposition temperature	No information available	
Kinematic viscosity	< 2 cPs	@ 40 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	0.80 ± 0.03 g/ml (@ 20°C)

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid contact with heat, sparks, open flame, and static discharge.

10.5 Incompatible materials

Incompatible with oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information	Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.
Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	Causes serious eye damage.
Skin contact	Repeated exposure may cause skin dryness or cracking.
Ingestion	May be fatal if swallowed and enters airways. Potential for aspiration if swallowed.

Aspiration may cause pulmonary edema and pneumonitis.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	> 2000 mg/kg (Rat) OECD 401 Literature data	> 2000 mg/kg (Rabbit) Literature data	No data available
Alcohols, C9-11-iso-, C10-rich	= 4626 mg/kg (Rat)	> 2600 mg/kg (Rabbit)	> 0.6 mg/L (Rat) 6 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact. Ingestion.

Routes of entry Ingestion. Skin contact. Eye contact. Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed and enters airways.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	LC50 (Oncorhynchus mykiss (rainbow trout)): 2 - 5 mg/l Exposure time: 96 h	EL50 (Pseudokirchneriella subcapitata (green algae)): > 1 - 3 mg/l	EL50 (Water flea (Daphnia magna)): 1,4 mg/l Exposure time: 48 h

	Test Type: semi-static test Test substance: WAF Method: OECD Test Guideline 203 Remarks: Information given is based on data obtained from similar substances.	Exposure time: 72 h Test Type: static test Test substance: WAF Method: OECD Test Guideline 201 Remarks: Information given is based on data obtained from similar substances.	Test Type: static test Test substance: WAF Method: OECD Test Guideline 202 Remarks: Information given is based on data obtained from similar substances.
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	LC50 = 2.4 mg/l 96 h. Litterature data.	EC50 = 18.6 mg/l 75 h. Literature data.	EC50 = 3.2 mg/l. 48h. Literature data.
Alcohols, C9-11-iso-, C10-rich	>10 - <100 mg/l	>10 - <100 mg/l	>10 - <100 mg/l

12.2 Persistence and degradability

Product is biodegradable.

Chemical Name	Persistence and degradability
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Inherently biodegradable OECD 301F : 58.6% Duration 28 days
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate.

Chemical Name	Bioaccumulation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Does not bioaccumulate

12.4 Mobility

Mobility
The product is insoluble and floats on water.

Chemical Name	Mobility
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Soluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
Amides, C8-18 (even numbered) and C18-unsatd., N, N-bis(hydroxyethyl)*	Not expected to adsorb on soil Notes: Calculated data (in silico)

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Does not comply

CAS Number 64742-47-8, 68155-07-7 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	30-Jun-2014
Revision date	27-Aug-2018
Version	2
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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SDS no. PID1530
Version 5
Revision date 16-Jan-2018
Supersedes date 04-Feb-2015

Safety Data Sheet
SPERSENE* CF

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name SPERSENE* CF
Product code PID1530

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Thinner.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
2.3 Other hazards

Suspended dust may present a dust explosion hazard
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sulphur dioxide.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Material becomes slippery when wet. Use caution if wet. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Suspended dust may present a dust explosion hazard Avoid heat, flames and other sources of ignition. Protect from moisture Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. See section 7 for more information

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European

	Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	Dark brown
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	3.0 - 4.0	2% sol.
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.53	20 °C
Bulk density	23.1-26.2 lb/ft³ (370-420 kg/m³)	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	250 - 300 °C / 482 - 572 °F	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid dust formation. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.
Listed on PLONOR list of OSPAR

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand hazard classification	Not classified.
HSNO approval no.	Not required.
Group number	Not required.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes date	04-Feb-2015
Revision date	16-Jan-2018
Version	5
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

*A mark of M-I L.L.C., a Schlumberger Company

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID11833
Version 7
Revision date 22-Oct-2019
Supersedes Date: 13-Oct-2016

Safety Data Sheet
STARGLIDE*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name STARGLIDE*
Product code PID11833

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lubricant

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H318 - Causes serious eye damage

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	500-012-0	9004-77-7	30-60

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. If conscious, drink plenty of water. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Immediate medical attention is required.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**

Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance No information available
Odor Slight
Color Yellow
Odor threshold Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	< -10 °C / 14 °F	
Boiling point/range	No information available	
Flash point	> 130 °C / > 266 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	0.93 - 0.97 g/ml

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

LD50 Oral > 2000 mg/kg (rat) Calculated (MIXTURE)

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	2630 mg/kg (Rat)	3540 mg/kg bw (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact.

Routes of entry Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that

large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	LC50 >1800 mg/l, 96h Scophthalmus maximus OECD 203	EC50: 2490 mg/l, 72h Selenastrum capricornutum OECD 201	EC50 >3200 mg/l, 48h Daphnia magna OECD 202

12.2 Persistence and degradability

Product is biodegradable. See component information below.

Chemical Name	Persistence and degradability
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	OECD 301D 76%

12.3 Bioaccumulative potential

The product contains potentially bioaccumulating substances. See component information below.

Chemical Name	Bioaccumulation
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	log Kow 0.44@20°C

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Soluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

New Zealand Hazard Classification Classified

HSNO approval no. HSR002606

Group number 8.3A

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes Date: 13-Oct-2016

Revision date 22-Oct-2019

Version 7

This SDS has been revised in the following section(s) All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information

National occupational exposure limits

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SDS no. D205
Version 2
Revision date 10-Jun-2020
Supersedes Date: 28-Jul-2016

Safety Data Sheet
Swelling Additive D205

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Swelling Additive D205
Product code D205

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Silicon Dioxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Silicon Dioxide	231-545-4	7631-86-9	1-5

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid generating or breathing dust. Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges. Ensure all equipment is electrically grounded before beginning transfer operations.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Keep away from direct sunlight. Avoid excessive heat for prolonged periods of time. Store at ambient conditions Store away from incompatibles, Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Silicon Dioxide	Not determined	2mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Silicon Dioxide	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Silicon Dioxide	1 mg/m³ MAC 2 mg/m³ MAC	6.0 mg/m³ TWA	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Silicon Dioxide	Not determined	Not determined	3 mg/m³ STEL 6 mg/m³ STEL 1 mg/m³ TWA 2 mg/m³ TWA Fibrogenic substance also vitreous, in the form of disintegration aerosol 1177 Fibrogenic substance in the form of condensation aerosol, containing >=10% Silicon dioxide 1175, 1176
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Silicon Dioxide	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Micro-beads
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	

Bulk density	300 - 400 Kg/m³	@ 20°C.
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	880 - 950 Kg/m³ @20°C

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Take precautionary measures against static charges. Keep away from open flames, hot surfaces and sources of ignition. Keep away from direct sunlight. Avoid excessive heat for prolonged periods of time. Store at ambient conditions.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Silicon Dioxide	= 7900 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 2.2 mg/L (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Ingestion. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
No product level data available. See component information below.

Toxicity to fish
No product level data available. See component information below.

Toxicity to daphnia and other aquatic invertebrates
No product level data available. See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Silicon Dioxide	= 5000 mg/L LC50 Brachydanio rerio 96 h	= 440 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 7600 mg/L EC50 Ceriodaphnia dubia 48 h

12.2 Persistence and degradability

The product is not expected to be biodegradable.

Chemical Name	Persistence and degradability
Silicon Dioxide	No information available

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

Chemical Name	Bioaccumulation
Silicon Dioxide	Not likely to bioaccumulate

12.4 Mobility

Mobility
The product is insoluble and floats on water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies

Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	28-Jul-2016
Revision date	10-Jun-2020
Version	2
This SDS has been revised in the following section(s)	3, 6, 7, 8, 10, 11, 12, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D198
Version 4
Revision date 06-Jul-2020
Supersedes Date: 09-Dec-2015

Safety Data Sheet
Synthetic Solid Cement Retarder D198

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Synthetic Solid Cement Retarder D198
Product code D198
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

_

Contains
Quartz, Crystalline silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Combustible dust

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Quartz, Crystalline silica	238-878-4	14808-60-7	60 - 100

Comments
The product contains other ingredients which do not contribute to the overall classification.
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water. Remove contaminated clothing and

shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors React with hydrofluoric acid (HF) forming toxic gas (SiF4).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. For personal protection see section 8.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Keep airborne concentrations below exposure limits. Provide appropriate exhaust ventilation at places where dust is formed. Take precautionary measures against static discharges.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Store away from incompatibles, React with hydrofluoric acid (HF) forming toxic gas (SiF4) Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Quartz, Crystalline silica	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Quartz, Crystalline silica	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**

Quartz, Crystalline silica	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Quartz, Crystalline silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Quartz, Crystalline silica	0.025 mg/m³ TWA	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene gloves Frequent change is advisable

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Solid
Appearance Powder
Odor Odorless
Color White - Tan

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	> 1700 ◦C / 3092 ◦F	
Boiling point/range	Not applicable	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	No information available	
Relative Vapor Density	No information available	
Specific gravity	2.3	@20 °C
Bulk density	1100 -1600 kg/m^3	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	
Explosive properties	Suspended dust may present a dust explosion hazard	
Oxidizing properties	No information available	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Quartz, Crystalline silica	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Lungs. Respiratory system.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that

large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Quartz, Crystalline silica	No information available	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Quartz, Crystalline silica	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Quartz, Crystalline silica	Product/Substance is inorganic

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Quartz, Crystalline silica	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Quartz, Crystalline silica	Not expected to adsorb on soil

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	09-Dec-2015
Revision date	06-Jul-2020
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID12189
Version 4
Revision date 16-May-2019
Supersedes Date: 23-Feb-2016

Safety Data Sheet
THRUCARB*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name THRUCARB*
Product code PID12189

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Bridging material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Calcium carbonate

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium carbonate	207-439-9	471-34-1	60-100
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium carbonate	Not determined	10mg/m³TWAinhalable dust	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium carbonate	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium carbonate	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA

			Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

Respiratory protection — When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	8.4 - 10.2	@ 5% sol.
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	

Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.5 - 2.8	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	825 °C / 1517°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium carbonate	Not Applicable - Inorganic chemical.
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium carbonate	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
See component information below.

Chemical Name	Mobility
Calcium carbonate	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium carbonate	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	23-Feb-2016
Revision date	16-May-2019
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID12188
Version 5
Revision date 15-Mar-2018
Supersedes Date: 16-Mar-2015

Safety Data Sheet
THRUTROL*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name THRUTROL*
Product code PID12188

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Fluid loss reducer.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
2.3 Other hazards

Suspended dust may present a dust explosion hazard
Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust

formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Suspended dust may present a dust explosion hazard Protect from moisture Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust. No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient

	ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder Dust
Odor	Slight
Color	Off-white
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	Not applicable	
pH @ dilution	9.0 - 10.5	@ 4%
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5	@ 20 °C
Bulk density	30 - 45 lb / ft³	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	16-Mar-2015
Revision date	15-Mar-2018
Version	5
This SDS has been revised in the following section(s)	All sections Product Code change No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information

National occupational exposure limits

Training Advice
Do not handle until all safety precautions have been read and understood
Follow general hygiene considerations recognized as common good workplace practices

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Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. D065
Version 6
Revision date 08-Jun-2021
Supersedes Date: 18-Jun-2014

Safety Data Sheet
TIC* D65 Dispersant

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name TIC* D65 Dispersant
Product code D065
Country Limitations This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Contains
Sodium sulfate (Impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Combustible dust

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Sodium sulfate (Impurity)	231-820-9	7757-82-6	1-5

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx), Sulfur dioxide.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Keep away from combustible material. Avoid contact with heat, sparks, open flame, and static discharge. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Take precautionary measures against static discharges. Use non-sparking tools and equipment. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid handling causing generation of dust. All equipment used when handling the product must be grounded. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Fine dust dispersed in air may ignite. Take precautionary measures against static discharges.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges. Ensure all equipment is electrically grounded before beginning transfer operations.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Protect from moisture

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.
Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m³ (Inhalable); 3 mg/m³ (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m³ (Total); 5 mg/m³ (Respirable).

Component Information

Chemical Name	**Arabic**	**Australia**	**Egypt**
Sodium sulfate (Impurity)	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium sulfate (Impurity)	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium sulfate (Impurity)	10 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium sulfate (Impurity)	Not determined	Not determined	10 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium sulfate (Impurity)	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Faint
Color	Tan

Property	**Values**	**Remarks**
pH	Approximately 10	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	Not applicable	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	Not applicable	
Flammability	Not applicable	
Explosion limits:		

Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	Not applicable	
Relative Vapor Density	Not applicable	
Specific gravity	0.8	20 °C
Bulk density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Density and/or Relative Density	No information available	

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid contact with heat, sparks, open flame, and static discharge. Protect from moisture. Keep away from direct sunlight.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium sulfate (Impurity)	> 10000 mg/kg (Rat)	> 4 g/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not classified.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium sulfate (Impurity)	= 13500 mg/L LC50 Lepomis	No information available	= 630 mg/L EC50 Daphnia magna

	macrochirus 96 h 3040 - 4380 mg/L LC50 Lepomis macrochirus 96 h > 6800 mg/L LC50 Pimephales promelas 96 h 13500 - 14500 mg/L LC50 Pimephales promelas 96 h		96 h = 2564 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated

IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam

Supersedes Date:	18-Jun-2014
Revision date	08-Jun-2021
Version	6
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID10480
Version 5
Revision date 10-Sep-2019
Supersedes Date: 16-Mar-2016

Safety Data Sheet
ULTRADRIL*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name ULTRADRIL*
Product code PID10480

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention

Supplementary precautionary statements
P362 + P364 - Take off contaminated clothing and wash it before reuse
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Sodium Chloride

Barite

Calcium carbonate

Potassium Chloride

Crystalline silica (impurity)

Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%

Sodium Chloride	231-598-3	7647-14-5	30-60
Barite	236-664-5	13462-86-7	10-30
Calcium carbonate	207-439-9	471-34-1	5-10
Potassium Chloride	231-211-8	7447-40-7	1-5
Crystalline silica (impurity)	238-878-4	14808-60-7	<2
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	-	9046-10-0	1-<3

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

The product contains other ingredients which do not contribute to the overall classification.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures

Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium Chloride	Not determined	Not determined	Not determined
Barite	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	10mg/m³TWAinhalable dust	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium Chloride	Not determined	Not determined	Not determined
Barite	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium Chloride	5 mg/m³ MAC	Not determined	Not determined
Barite	6 mg/m³ MAC	Not determined	Not determined
Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Potassium Chloride	5 mg/m³ MAC	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium Chloride	Not determined	Not determined	5 mg/m³ MAC
Barite	Not determined	Not determined	6 mg/m³ TWA Fibrogenic substance 0242
Calcium carbonate	Not determined	Not determined	Not determined
Potassium Chloride	Not determined	Not determined	5 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA

			Fibrogenic substance 1177, 1178
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium Chloride	Not determined	Not determined	Not determined
Barite	Not determined	Not determined	Not determined
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined
Potassium Chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Viscous
Odor	Mild
Color	Light brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Inhalation May cause irritation of respiratory tract.

Eye contact Causes serious eye irritation.

Skin contact Causes skin irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium Chloride	= 3 g/kg (Rat)	> 10 g/kg (Rabbit)	> 42 g/m³ (Rat) 1 h
Barite	> 15000 mg/kg (Rat)	No data available	No data available
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available
Potassium Chloride	= 2600 mg/kg (Rat)	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	2885 mg/kg (Rat) OECD 401	2979 mg/kg (Rabbit) OECD 402	> 0.74 mg/l (Rat) OECD 403

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Eye contact. Skin contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium Chloride	4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h
Barite	No information available	No information available	No information available
Calcium carbonate	No information available	No information available	No information available
Potassium Chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	LC50 >700 mg/l 96h	EC50 >700 mg/l 72h	EC50 >1001 mg/l 48h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Barite	Inorganic compound
Calcium carbonate	Not Applicable - Inorganic chemical.
Crystalline silica (impurity)	Inorganic compound

Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Barite	Product/Substance is inorganic
Calcium carbonate	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Does not bioaccumulate

12.4 Mobility

Mobility
Insoluble in water. See component information below.

Chemical Name	Mobility
Barite	Insoluble in water
Calcium carbonate	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Barite	Not expected to adsorb on soil
Calcium carbonate	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code.
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Potassium Chloride
Schedule 4

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	16-Mar-2016
Revision date	10-Sep-2019
Version	5
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. PID10482
Version 7
Revision date 18-Feb-2019
Supersedes Date: 09-Oct-2015

Safety Data Sheet
ULTRAHIB*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name ULTRAHIB*
Product code PID10482

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale inhibitor.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1C
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P363 - Wash contaminated clothing before reuse

Contains
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Thermal decomposition can lead to release of toxic and corrosive gases/vapors

Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	-	9046-10-0	60-100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Rinse mouth. Never give anything by mouth to an unconscious person. Get immediate medical attention.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention at once.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing agent suitable for type of surrounding fire.

Extinguishing media which must not be used for safety reasons
High volume water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Keep people away from and upwind of spill/leak. Do not get on skin or clothing. Wash thoroughly after handling. Avoid contact with eyes. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong acids
Storage class	Corrosive storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes
Chemical splash goggles and/or face shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene Rubber
Break through time >480 minutes
Glove thickness >=0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Ammoniacal
Color	Colorless
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	9.0 - 9.5	(Neat)
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	> 93 °C / > 200 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.993 - 1.023	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	80 - 120 cP	@ 24 °C
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Not known.

10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition.

10.5 Incompatible materials

Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapors may irritate throat and respiratory system. Inhaled corrosive substances can lead to a toxic edema of the lungs.

Eye contact Causes burns. May cause irreversible damage to eyes.

Skin contact Causes severe skin burns.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	2885 mg/kg (Rat) OECD 401	2979 mg/kg (Rabbit) OECD 402	> 0.74 mg/l (Rat) OECD 403

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Skin contact. Eye contact. Inhalation.
Routes of entry	Skin contact. Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	LC50 >700 mg/l 96h	EC50 >700 mg/l 72h	EC50 >1001 mg/l 48h

12.2 Persistence and degradability

Product is not biodegradable. See component information below.

Chemical Name	Persistence and degradability
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

Chemical Name	Bioaccumulation
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Does not bioaccumulate

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

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14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG) UN2735
UN No. (IMDG/ANTAQ) UN2735
UN No. (ICAO/ANAC) UN2735

14.2. UN proper shipping name

AMINES, LIQUID, CORROSIVE, N.O.S. (contains Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups)

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	III
IMDG/ANTAQ Packing group	III
ICAO/ANAC Packing group	III

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2X
Tunnel restriction code	(E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	09-Oct-2015
Revision date	18-Feb-2019
Version	7
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D188
Version 4
Revision date 29-Mar-2021
Supersedes Date: 23-Mar-2016

Safety Data Sheet
UltraLITE D188

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name UltraLITE D188
Product code D188

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
Level 5, 10 Telethon Avenue
Perth WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

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Contains
Silica, amorphous

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Silica, amorphous	231-545-4	7631-86-9	<=3

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Contaminated surfaces will be extremely slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Contaminated surfaces will be extremely slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Protect from moisture

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m³ Respirable Dust, 10mg/m³ Total Dust.

Component Information

Chemical Name	Arabic	Australia	Egypt
Silica, amorphous	Not determined	2mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Silica, amorphous	10 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Silica, amorphous	1 mg/m³ MAC 2 mg/m³ MAC	6.0 mg/m³ TWA	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Silica, amorphous	Not determined	Not determined	3 mg/m³ STEL 6 mg/m³ STEL 1 mg/m³ TWA 2 mg/m³ TWA Fibrogenic substance also vitreous, in the form of disintegration aerosol 1177 Fibrogenic substance in the form of condensation aerosol, containing >=10% Silicon dioxide 1175, 1176
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Silica, amorphous	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	White

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability	Not applicable	
Explosion limits:		
Upper explosion limit	No information available	
Lower explosion limit	No information available	
Vapor pressure	No information available	

Relative Vapor Density	No information available
Specific gravity	No information available
Bulk density	No information available
Water solubility	Insoluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
Partition Coefficient (n-octanol/water)	No information available
Density and/or Relative Density	0.35 - 0.41 g/cm³
Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid heat, flames and other sources of ignition. Protect from moisture.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Silica, amorphous	= 7900 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 2.2 mg/L (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Silica, amorphous	= 5000 mg/L LC50 Brachydanio rerio 96 h	= 440 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 7600 mg/L EC50 Ceriodaphnia dubia 48 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Silica, amorphous	Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Silica, amorphous	Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
The product is insoluble and floats on water.

Mobility in soil
No information available.

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not applicable
Group number	Not applicable

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP) Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam

Supersedes Date:	23-Mar-2016
Revision date	29-Mar-2021
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. D168
Version 4
Revision date 23-Mar-2018
Supersedes Date: 19-Feb-2015

Safety Data Sheet
UNIFLAC* L D168

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name UNIFLAC* L D168
Product code D168

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
Eye Contact	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
High volume water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of toxic and corrosive gases/vapors Nitrogen oxides (NOx), Sulphur oxides.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Contaminated surfaces will be extremely slippery. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide sufficient air exchange and/or exhaust in work rooms.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store above freezing temperature Store away from incompatibles, Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl Neoprene Nitrile Break through time >480 minutes Glove thickness >0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Odorless
Color	White - Light yellow
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	7	@ 20 °C
pH @ dilution	10 g/l	
Melting / freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Similar to water.	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	2.34 kPa	@ 20 °C
Vapor density	No information available	
Specific gravity	1.06 g/cm3	@ 20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	500 °C / 932 °F	
Decomposition temperature	260 °C / 500 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	2000 - 4000 mPa s	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	Not applicable

9.2 Other information

Pour point	-6°C / 21.2 °F
Molecular weight	No information available
VOC content(%)	None
Density	1.06 g/cm³ (20°C)

Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Do not freeze.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Skin contact. Eye contact. Inhalation.

Routes of entry	No route of entry noted.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not applicable
Group number	Not applicable

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes Date:	19-Feb-2015
Revision date	23-Mar-2018
Version	4
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

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SDS no. D177
Version 9
Revision date 26-Jan-2021
Supersedes Date: 24-Aug-2018

Safety Data Sheet
UNISET-LT D177

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name UNISET-LT D177
Product code D177

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
WARNING

H290 - May be corrosive to metals

Precautionary statements
P234 - Keep only in original container
P390 - Absorb spillage to prevent material damage
P406 - Store in corrosion resistant container with a resistant inner liner

–

Contains
Phosphoric Acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Phosphoric Acid	231-633-2	7664-38-2	5-<10

Comments
Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.

The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, fog, Carbon dioxide (CO_2), foam or dry chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Oxides of phosphorus.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2X

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight. Store at ambient conditions Protect from freezing Avoid excessive heat for prolonged periods of time. Store away from incompatibles, Strong oxidizing agents Aluminum Carbon steel

Storage class Corrosive storage.

Packaging materials High density polyethylene (HDPE) drum or can Plastic container

Packaging materials to be avoided Do not use carbon steel or aluminum tools or equipment.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Phosphoric Acid	3 mg/m³ STEL 1 mg/m³ TWA	3mg/m³STEL 1mg/m³TWA	3 mg/m³ STEL 1 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**

Phosphoric Acid	3 mg/m³ STEL 1 mg/m³ TWA	1 mg/m³ TWA Skin notation 3 mg/m³ STEL	1 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Phosphoric Acid	Not determined	1.0 mg/m³ TWA 3.0 mg/m³ STEL	1 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Phosphoric Acid	1 mg/m³ TWA	1 mg/m³ TWA	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Phosphoric Acid	1 mg/m³ TWA	1 mg/m³ TWA 3 mg/m³ STEL	2 mg/m³ STEL 1 mg/m³ TWA

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles

Hand protection
Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Nitrile PVA PVC
Break through time >480 minutes
Glove thickness >=0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators Respirator with combination filter for vapour/particulate (EN 141) Type A/P3. At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Eye wash and emergency shower must be available at the work place. Wear appropriate personal protective clothing to prevent skin contact

Hygiene Measures
Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	No information available
Color	Green
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	1.5 - 1.9	
pH @ dilution	Not applicable	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.106	@20 °C
Bulk density	No information available	
Relative density	1.106	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive to Metals.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time. Keep away from direct sunlight. Store at ambient conditions. Protect from freezing.

10.5 Incompatible materials

Strong oxidizing agents. Carbon steel. Aluminium.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapors may irritate throat and respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Phosphoric Acid	= 1530 mg/kg (Rat)	= 2740 mg/kg (Rabbit)	> 850 mg/m³ (Rat) 1 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure None known.

Routes of entry None known.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Phosphoric Acid	3 - 3.5 mg/L LC50 Gambusia affinis 96 h	No information available	= 4.6 mg/L EC50 Daphnia magna 12 h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Phosphoric Acid	Readily biodegradable

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Phosphoric Acid	No bioaccumulation potential

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Chemical Name	Mobility
Phosphoric Acid	Miscible in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Phosphoric Acid	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1760
UN No. (IMDG/ANTAQ)	UN1760
UN No. (ICAO/ANAC)	UN1760

14.2. UN proper shipping name

CORROSIVE LIQUID, N.O.S. (contains Phosphoric Acid)

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	III
IMDG/ANTAQ Packing group	III
ICAO/ANAC Packing group	III

14.5 Environmental hazard

No

14.6 Special precautions

Hazard identification no (ADR)	80

EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2X
Tunnel restriction code	(E)
Hazchem code ADG	2X

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Phosphoric Acid
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies
Eurasian Economic Union: Russian Inventory	

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	24-Aug-2018
Revision date	26-Jan-2021
Version	9
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com

Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	0
Flammability	1
Physical hazard	4
PPE	E

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SDS no. SYS00064
Version 1
Revision date 16-Jul-2021
Supersedes Date: None

Safety Data Sheet
VERATHERM*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name VERATHERM*
Product code SYS00064

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Australia Pty Ltd
ABN: 67 009 214 162
Level 5
10 Telethon Avenue
Perth
WA 6000

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
DANGER

Hazard Statements
H315 - Causes skin irritation
H318 - Causes serious eye damage

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves and eye/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P332 + P313 - If skin irritation occurs: Get medical advice/attention

Supplementary precautionary statements
P362 + P364 - Take off contaminated clothing and wash it before reuse

Contains
Calcium carbonate

Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups

2-aminoethanol

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Calcium carbonate	207-439-9	471-34-1	10-30
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	-	9046-10-0	1-<3
2-aminoethanol	205-483-3	141-43-5	1-<3
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

Comments
The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact — Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice — The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation — Please see Section 11. Toxicological Information for further information.

Ingestion — Please see Section 11. Toxicological Information for further information.

Skin contact — Please see Section 11. Toxicological Information for further information.

Eye contact — Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician — Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards

None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply. No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Calcium carbonate	Not determined	10mg/m³TWAinhalable dust	Not determined
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
2-aminoethanol	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA	6ppmSTEL 15mg/m³STEL 3ppmTWA 7.5mg/m³TWA	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Calcium carbonate	Not determined	Not determined	Not determined
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
2-aminoethanol	Not determined	3 ppm TWA Skin notation 6 ppm STEL	3 ppm OEL 7.5 mg/m³ OEL
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Calcium carbonate	Not determined	Not determined	10 mg/m³ TWA
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
2-aminoethanol	0.5 mg/m³ MAC	8.0 mg/m³ TWA 3.0 ppm TWA 15.0 mg/m³ STEL 6.0 ppm STEL	6 ppm STEL 15 mg/m³ STEL 3 ppm TWA 7.5 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Calcium carbonate	Not determined	Not determined	Not determined
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined
2-aminoethanol	3 ppm TWA 7.5 mg/m³ TWA	3 ppm TWA 6 mg/m³ TWA	0.5 mg/m³ MAC Skin
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Calcium carbonate	Not determined	10 mg/m³ TWA	Not determined
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not determined	Not determined	Not determined

2-aminoethanol	3 ppm TWA	8 mg/m³ TWA 15 mg/m³ STEL	3 ppm STEL 7.6 mg/m³ STEL Skin 1 ppm TWA 2.5 mg/m³ TWA
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene
Break through time >480 minutes
Glove thickness >=0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection — In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapour/particulate (EN 141) Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Liquid
Appearance — Viscous
Odor — Faint
Color — White - Brown

Property	Values	Remarks
pH	No information available	

pH @ dilution	No information available
Melting / freezing point	Not applicable
Boiling point/range	> 100 °C / > 212 °F
Flash point	> 100 °C / > 212 °F
Evaporation rate (BuAc =1)	No information available
Flammability	Not applicable
Explosion limits:	
Upper explosion limit	No information available
Lower explosion limit	No information available
Vapor pressure	No information available
Relative Vapor Density	No information available
Specific gravity	1.0 - 2.3
Bulk density	No information available
Water solubility	Miscible with water.
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
Partition Coefficient (n-octanol/water)	No information available
Density and/or Relative Density	No information available
Explosive properties	Not applicable
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact Causes serious eye damage.

Skin contact Causes skin irritation. Components of the product may be absorbed into the body through the skin.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg (Rat)	No data available	No data available
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	2885 mg/kg (Rat) OECD 401	2979 mg/kg (Rabbit) OECD 402	> 0.74 mg/l (Rat) OECD 403
2-aminoethanol	= 1720 mg/kg (Rat)	= 1000 mg/kg (Rabbit) = 1 mL/kg (Rabbit)	> 1.3 mg/l Vapour 6h (Rat)
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Skin contact. Eye contact.

Routes of entry Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

11.2 Information on other hazards

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	LC50 >700 mg/l 96h	EC50 >700 mg/l 72h	EC50 >1001 mg/l 48h
2-aminoethanol	> 200 mg/L LC50 Oncorhynchus mykiss 96 h = 3684 mg/L LC50 Brachydanio rerio 96 h 300 - 1000 mg/L LC50 Lepomis macrochirus 96 h 114 - 196 mg/L LC50 Oncorhynchus mykiss 96 h = 227 mg/L LC50 Pimephales promelas 96 h	= 15 mg/L EC50 Desmodesmus subspicatus 72 h	= 65 mg/L EC50 Daphnia magna 48 h
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium carbonate	Not Applicable - Inorganic chemical.
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Not biodegradable
2-aminoethanol	Readily biodegradable
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium carbonate	Product/Substance is inorganic
Reaction products of propane-1,2-diol, propoxylated by amination of the terminal hydroxyl groups	Does not bioaccumulate
2-aminoethanol	Does not bioaccumulate log Kow -1.91
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
The product is miscible with water. May spread in water systems. See component information below.

Chemical Name	Mobility
Calcium carbonate	Insoluble in water
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Calcium carbonate	Not expected to adsorb on soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Other adverse effects

None known.

12.6 Other information.

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)
ADR/RID/ADN/ADG Hazard class Not regulated
IMDG/ANTAQ Hazard class Not regulated
ICAO/ANAC Hazard class/division Not regulated

14.4 Packing group
ADR/RID/ADN/ADG Packing group Not regulated
IMDG/ANTAQ Packing group Not regulated
ICAO/ANAC Packing group Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Maritime transport in bulk according to IMO instruments
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-aminoethanol
Schedule 4
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Does not comply
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Revision date	16-Jul-2021
Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information

National occupational exposure limits

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SDS no. PID2234
Version 2
Revision date 19-Mar-2019
Supersedes Date: 07-Jun-2016

Safety Data Sheet
WALNUT NUTPLUG*

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name WALNUT NUTPLUG*
Product code PID2234

Synonyms WALNUT NUT PLUG* FINE, WALNUT NUT PLUG* COARSE

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Lost circulation material.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
M-I Australia Pty Ltd
ABN: 67 009 214 162
Level 5
256 St. George Tce
Perth
WA 6000
T = +61 08 9440 2900
F = +61 08 9322 3080
+47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains
Polysaccharide

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Combustible dust

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Cellulose	Listed	Proprietary	60-100
Crystalline silica (impurity)	238-878-4	14808-60-7	<1

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact — Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.

Eye Contact — Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Polysaccharide	10 mg/m³ TWA	10mg/m³TWAinhalable dust	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Polysaccharide	Not determined	10 mg/m³ TWA	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Polysaccharide	2 mg/m³ MAC	Not determined	10 mg/m³ TWA
Crystalline silica (impurity)	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Polysaccharide	10 mg/m³ TWA	Not determined	10 mg/m³ MAC
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL

			1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Polysaccharide	Not determined	10 mg/m³ TWA 5 mg/m³ TWA 20 mg/m³ STEL	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection — Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles

Hand protection — Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

Respiratory protection — No protective equipment is needed under normal use conditions In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection — Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures — Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure — Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state — Solid
Appearance — No information available
Odor — Odorless
Color — Light brown
Odor threshold — Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	193 °C / 380 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.1 - 1.4	@ 20 °C
Bulk density	577-641 kg/m³/36-40 lb/ft3	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	Not applicable	
Dynamic viscosity	No information available	
log Pow	Not determined	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point No information available
Molecular weight No information available
VOC content(%) None
Density No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges.

10.5 Incompatible materials

Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polysaccharide	> 5 g/kg (Rat)	> 2 g/kg (Rabbit)	> 5800 mg/m³ (Rat) 4 h
Crystalline silica (impurity)	= 500 mg/kg (Rat)	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polysaccharide	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

New Zealand Hazard Classification	Not classified
HSNO approval no.	Not required
Group number	Not required

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	07-Jun-2016
Revision date	19-Mar-2019
Version	2
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier

National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	1
Physical hazard	0
PPE	E

*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. D157
Version 8
Revision date 21-Aug-2020
Supersedes Date: 22-Jan-2020

Safety Data Sheet
Weighting Agent D157

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Weighting Agent D157
Product code D157

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a cementing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Reproductive toxicity	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H361 - Suspected of damaging fertility or the unborn child

Precautionary statements
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Trimanganese tetradioxide

Crystalline silica (impurity)

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Trimanganese tetradioxide	215-266-5	1317-35-7	60-100
Crystalline silica (impurity)	238-878-4	14808-60-7	1-<3

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water spray, dry chemical, carbon dioxide (CO_2), or foam.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid generating or breathing dust. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid handling causing generation of dust. Not to be used by pregnant workers and workers who have recently given birth or who are breastfeeding.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Acids Oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Trimanganese tetradioxide	Not determined	1mg/m³TWA	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined

Chemical Name	India	Indonesian	Japan
Trimanganese tetradioxide	Not determined	Not determined	0.2 mg/m³ ACL 0.2 mg/m³ OEL
Crystalline silica (impurity)	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Trimanganese tetradioxide	Not determined	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Trimanganese tetradioxide	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Trimanganese tetradioxide	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection
Use eye protection according to EN 166, designed to protect against powders and dusts
Tightly fitting safety goggles Safety glasses with side-shields

Hand protection
Wear gloves according to EN 374 to protect against skin effects from powders
Impervious gloves made of: Neoprene Nitrile PVC
Frequent change is advisable

Respiratory protection
In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection
Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures
Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure
Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	Red brown
Odor threshold	Not applicable

Property	**Values**	**Remarks**
pH	No information available	
pH @ dilution	7-10	5g/50ml H2O
Melting / freezing point	1550-1650° C / 2822-3002° F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	4.7 - 4.9 g/cm^3	
Bulk density	No information available	
Relative density	0.97-1.01 kg/cm3	@ 20°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Acids. Oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Trimanganese tetradioxide	No data available	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Routes of Exposure Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Trimanganese tetradioxide	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia manga (Water flea): > 10000 mg/l 24h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

No

Marine pollutant

No

14.6 Special precautions

Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)
The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
Supersedes Date:	22-Jan-2020
Revision date	21-Aug-2020
Version	8
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*

Flammability	0
Physical hazard	0
PPE	E

Disclaimer

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Appendix B. Geotechnical Risk Assessment

Valhalla Gas Exploration and Appraisal Program

Geotechnical Risk Analysis

BNR_EXP_RE_001

VERSION HISTORY				
Ver. No.	**Ver. Date**	**Author**	**Reviewer**	**Revision**
1	10 Jan 2022	RH	JM, JH, AF, AdV	For EPA submission

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Acronyms / Definition

Acronym	Expansion / Definition
BNR	Bennett Resources Pty Ltd
B.S.	Bachelor of Science
DIF	Drilling induced fracture
DoL	Declaration of Location
e.g.	For example
EP 371	Exploration Permit 371
GISERA	Gas Industry Social and Environmental Research Alliance
HFS	Hydraulic fracture stimulation
ISO	International Organization for Standardization
km	kilometre
m	meter
m AHD	meters Australian Height Datum
mg/L	milligrams per litre
ML	Richter local magnitude (ML) is defined to be used for 'local' earthquakes up to 600 km away
mmscf/d	million standard cubic feet per day, a unit of measurement for gases
SH_{min}	Minimum horizontal stress
SH_{max}	Maximal horizontal stress
Sv	Vertical stress
U.S.	United States
WOB	Wellbore breakouts
2D	Two dimensional
3D	Three dimensional
4D	Four dimensional

1 Summary

This document provides a Geotechnical Risk Analysis for the Bennett Resources Pty Ltd's (BNR) Valhalla Gas Exploration and Appraisal Program (the Proposal) – as required by the Environmental Scoping Document Item 12.

Geotechnical risk assessments are not a single one-off activity. They utilise data acquired from successive petroleum activities to provide a more detailed and comprehensive understanding of the subsurface geology. As they progress, they inform future field design, well design and subsequent mitigations to enable risks are continually reduced to as low as reasonably practicable. One such mitigation that has been implemented is an 'early warning' mechanism that allows a proactive adaptive management approach to be followed in the field during hydraulic fracture stimulation (HFS) activities. This is detailed in Annex A.

As an overview, a geotechnical risk analysis is completed via the following phases:

- **Definition of structural context**: this is where existing data sources are analysed to provide an understanding of the subsurface geology. Specifically, the data sources are "stitched" together to form a picture of the area between data sources
- **Identification of hydrologically active faults**: the subsurface geology data is reviewed and interrogated with other desktop sources to identified if / where any active faults could occur within the field of interest
- **Assessment of well seal effectiveness**: once there is a good handle on the subsurface geology, each of the formations can be reviewed to understand if they provide a suitable geological seal between useable aquifers and targeted formations
- **Definition of potential high-risk zones**: once the subsurface geology and known faults have been understood after review of existing drilling data and new seismic data, specific fault zones or other weak areas will be reviewed or identified.

Based upon the process detailed above, the data for a comprehensive risk analysis is only considered preliminary given data from the wells as they are drilled will be utilised to update the subsurface geological understanding. The data gathered by historical activities are sufficient, when coupled with current regional work, to allow for a generalised risk analysis to be completed. The outcome of this geotechnical risk analysis is consistent with the outcomes of the most recent geotechnical risk evaluation (Buru Energy 2013) conducted by the previous operator of the exploration permit EP 371, Buru Energy. This evaluation concluded the following points:

- "in the Valhalla area, >600 m lies between the deepest recognised aquifer and the shallowest proposed hydraulic stimulation zones" (Buru Energy 2013) that were envisioned at the time. The actual interval between the highest stimulation and potential aquifer was 1,213 m
- in the Asgard area, there was initially planned to be a few hundred meters between the deepest recognised aquifer and the shallowest hydraulic stimulation zones; the actual interval between the stimulations and potential aquifer was 1192 m
- in the northern Canning Basin, "although there is evidence for some hydrocarbons that have naturally migrated into the shallower aquifers over ~200 million years, the very low/lack of hydrocarbon saturations in the Upper Anderson, Reeves, Lower Grant and Mesozoic formations above the Laurel Basin-Centered Gas System demonstrate that hydrocarbons cannot migrate vertically through these rocks" (Buru Energy 2013)
- some faults and fractures have been identified from seismic data and borehole image analysis within the section of interest for hydraulic stimulation. However, all faults identified are closed and strike in a direction that is approximately orthogonal to the maximum horizontal stress (SH_{max}) such that although they may negatively impact upon fracture propagation, they pose no geomechanical hazard for upward propagation of fracturing fluids or hydrocarbons into the recognised aquifers as the activation energy required to dilate faults or fractures in tension will be higher than overburden, which means the fracture growth would rotate to horizontal before opening such faults in tension.

2 Definition of the structural context

BNR has reviewed all the currently available engineering and geoscientific data on EP 371. The review was focused on existing well logs and 2D seismic data using a standard unconventional and petroleum systems workflow. This work built upon the substantial foundation of work and research done by the Western Australian government, and previous permit operators Buru Energy and Mitsubishi Australia. A key document relating to past exploration and engineering results for the unconventional resources on the permit is the EP-371 Discovery Assessment Report Asgard-1 and Valhalla North-1 (Buru Energy 2016). The information contained in the Buru Energy discovery assessment report (2016) and associated documents submitted by Buru Energy are referred to here but not repeated in this document. The EP 371 Discovery Assessment Report notes the key geological and engineering data acquired up through September 2016 which defines the basin-centred gas accumulation and the expected unconventional tight wet gas pool within the permit and Declaration of Location (DoL – refer to Figure 2-3). Two key wells (Asgard 1 and Valhalla North 1) have been drilled, stimulated, and flowed back to demonstrate that wet gas and condensate are present within the permit. Asgard 1 and Valhalla North 1 were located 40 km apart and were truly exploratory as they were drilled outside of any structure.

Leveraging the past efforts of Buru Energy, BNR has progressed in its understanding of the underlying geology and reservoir characteristics. Reviews by BNR continue to be conducted on the existing data. This work includes developing a better understanding of the existing geological formations and the overlying section. It is our intent to advance our understanding with new additional data and interpretations will need to be re-undertaken as additional tests are run on existing wells, new exploration and appraisal wells are drilled, and future seismic data is acquired and brought in-house.

To understand the structural context, the entire geological setting of the Canning Basin has been studied.

2.1 Canning Basin

The Canning Basin is a geologically old basin with Ordovician sedimentary rocks deposited onto Precambrian basement. The Fitzroy Trough is a structural feature on the northern edge of the basin that extends to a depth of up to 18 km (Cadman, et al. 1993). Significant infilling of the basin took place from Carboniferous to Permian and in the Cretaceous, during which period the basin was a shallow seaway. Thick sections of Permian (Grant Group) and Carboniferous terrigenous clastics (Reeves, Anderson, and Laurel Formations) then prograded over some additional deeper petroleum prone targets. Multiple tectonic phases within the basin took place both syndepositionally and post-depositionally, modifying the petroleum systems with an extensive set of both transpressional and extensional fault systems (Zhan and Mory 2013), as seen in Figure 2-1. Tertiary and Triassic sections are notably absent in the basin.

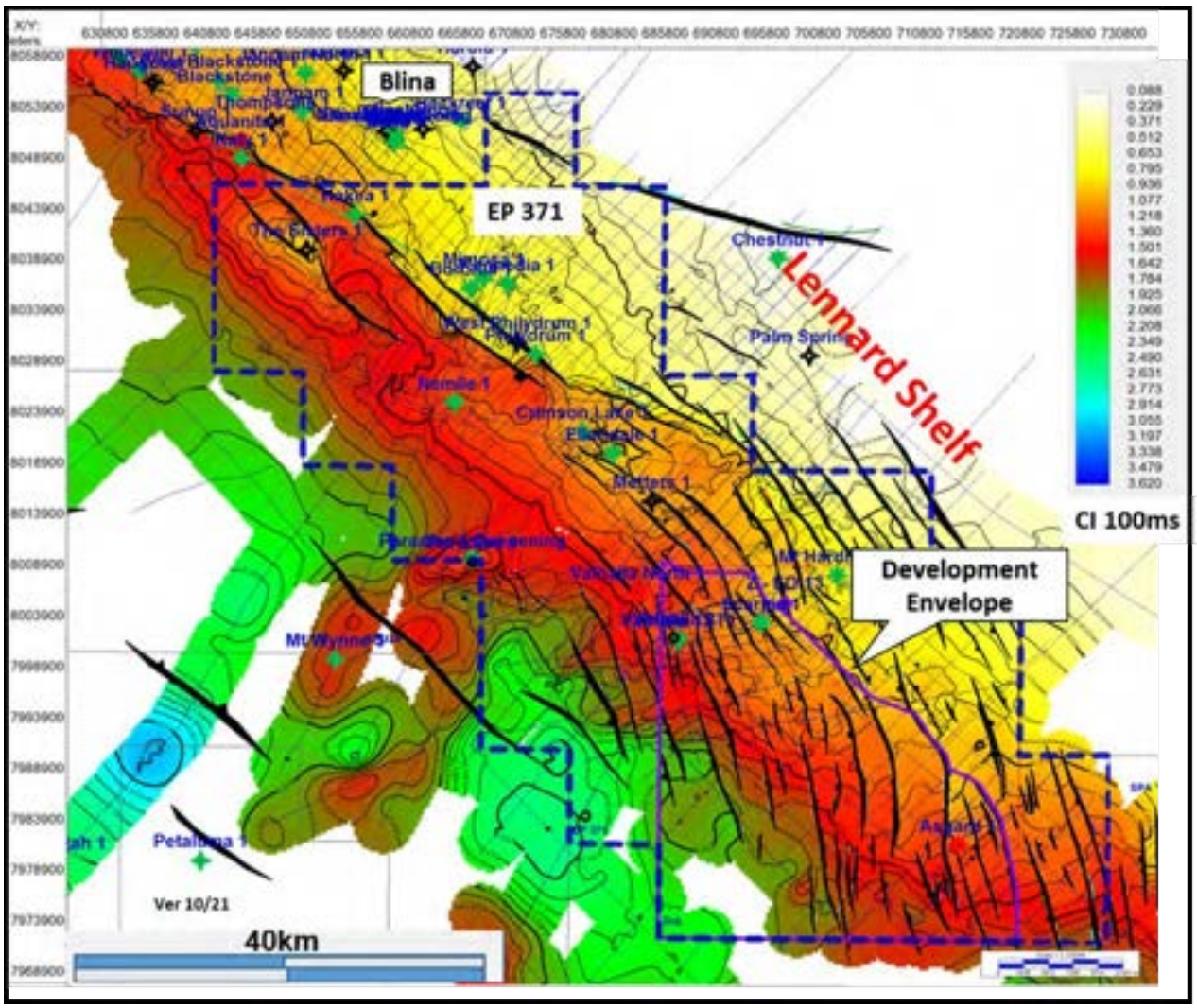

Figure 2-1: Regional Top Laurel Time Structure Map over EP 371 illustrating the deeper basin depocenter related to the underlying Fitzroy Trough to the southwest along with some of the established faulting within the DoL

2.2 Geological summary of the Laurel Formation and above geological section within EP 371

A review of the geochemical, petrophysical and existing 2D seismic data establishes an extensive basin-centred gas fairway beginning at 2,000 m and continuing to over 4,500 m in depth which is significantly deeper than any take points in the aquifer for water wells. This fairway steps down from the basin margins (Figure 2-1) into the depths of the Fitzroy Trough and is analogous and correlative to a similar petroleum system that hosts gas discoveries on the opposite margin of the trough (Yulleroo-2, a 3 stage frac that produced up to 1.5 mmscf/d).

The seismic data demonstrate a steep deepening of the Laurel Formation section into the basin with numerous normal downthrown faults parallel to the shelf margin that typically have throws (vertical component of the separation) of over 100 m (Figure 2-2 and Figure 2-3). Complex structuring that occurred during the basin's extensional phases controlled and influenced the carbonate sequences. The Permian Carboniferous Meda transpressional (strike slip and compressional structuring) event followed by the later Fitzroy Transpression in the Triassic-Jurassic caused reactivation and inversion on several the basement faults. Within the area of interest is located the Meda unconformity between the Reeves and Anderson Formations with an additional unconformity between the Reeves and overlying Grant Group formations.

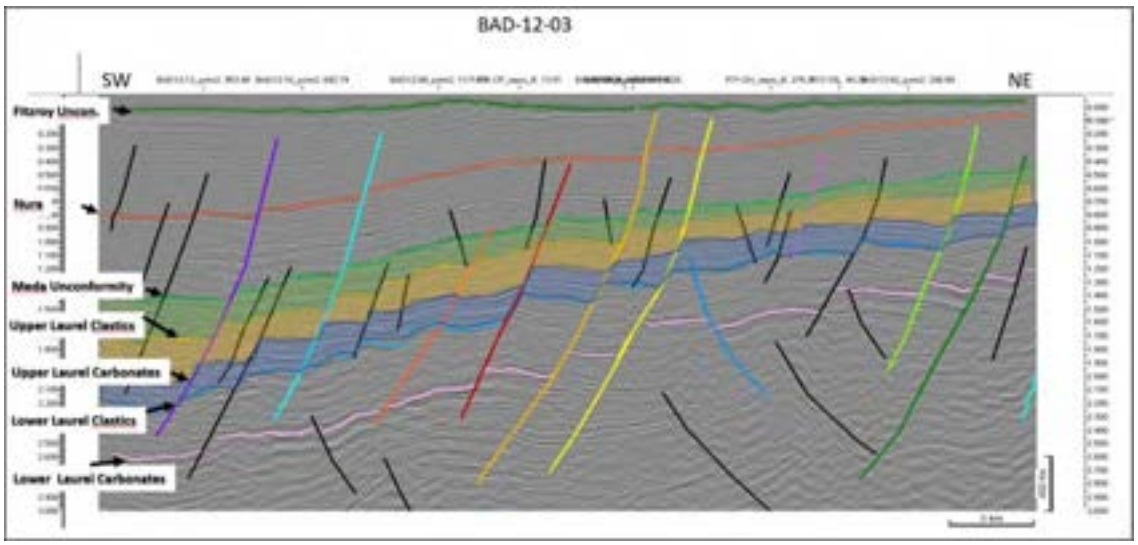

Figure 2-2: A 2D seismic line in two-way time along the northern edge of the Fitzroy Trough showing the Anderson (Green) and Upper Laurel Formation (Yellow and Blue) benches down stepping into the basin. Some expansion of the Laurel and Anderson Formation sequence is shown. An extensive database of 2D seismic was used to map in three dimensions the structural style of the basin margin. Location of this 33 km long line is shown in Figure 23.

The Grant is the deepest know aquifer in this part of the basin; the Betty Unit is in the lowermost part of the Grant Formation. The base of the Grant to uppermost Reeves is often difficult to recognize on 2D seismic. New 2D data and a potential 3D seismic program should better define the shallow sections.

2.3 Structure of the Laurel Formation and shallower section within the DoL of EP371

The structural evolution of the section of interest in this study is tied to the deformation within the Fitzroy Trough. The Fitzroy Trough has several major transtensional (strike slip and extensional structuring) and transpressional faults within it that may have strike slip offsets more than several kilometres. Within the trough are several large-scale synclines and anticlines, some with surface expression (St. George Ranges). Faults imaged within the trough downdip of EP 371 on 2D seismic data can be interpreted as exhibiting complex flower structures.

A series of normal and strike slip faults down to the southwest is noted across the DoL that have had movement up through Noonkanbah (Permian) time (Figure 2-2) which is marked as the Fitzroy Unconformity. Some normal faults have potentially more than one episode of movement as evidence by changes in dip regarding depth. There are also some antithetic faults noted into the larger master faults. Overall faults change their orientation from north-west to south-east to a more north-south strike orientation within the southern portion of the DoL (Figure 2-3). The fault orientation for most faults is 90 degrees off of the north-east / south-west oriented SH_{max} orientation which should reduce the risk of fault slippage during HFS. Further review of fault slip tendances can be conducted when additional 2D and or 3D seismic data are acquired.

Typical fault blocks are 4-6 km in breath and often 5-10 km in length based on the current 2D data. The Laurel Formation steps down as a series of terraces into the trough along these faults. Current 2D data allows BNR to tie together major faults between seismic lines but there are several faults that are less substantial that are difficult to correlate out beyond a one- or two-line interpretation. It is important to note the lack of faults on the map in the south-western corner of the DoL does not indicate that no faults are present, BNR does not have any data currently there to map the faults. BNR will continue to map the subsurface geology in accordance with EP 371 permit conditions. Specifically, future seismic program data will highlight fault blocks that are smaller in nature and potentially more complex.

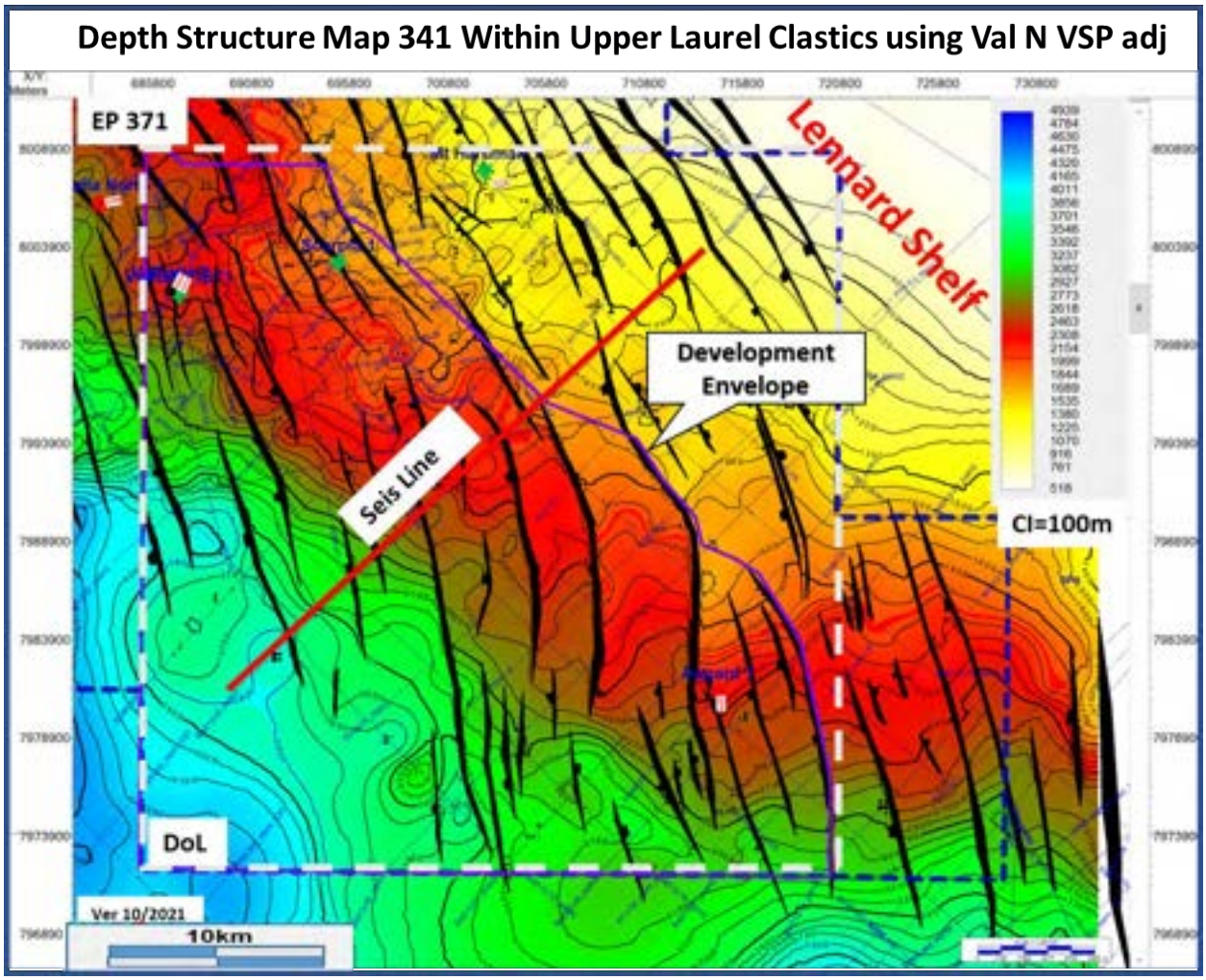

Figure 2-3: The 341 surfaces just above the Upper Laurel Carbonate is shown highlighting a number of downthrown normal faults stepping into the basin. The DoL is marked with the box. The location of the seismic line from Figure 2-2 is also marked

2.4 Definition of subsurface state of stress

BNR's current understanding of stress is based on data from the recently drilled Asgard 1, Valhalla North 1 and other Valhalla wells as well as the world stress map (WSM 2016). SH_{max} is anticipated to be in a north-east to south-west direction based on existing well data (Figure 2-4) and a review of the world stress map (WSM 2016). BNR's understanding of the subsurface state of stress is as follows:

- the stress regime is considered strongly to mildly anisotropic with fractures propagating in tension primarily in the SH_{max} direction.
- per Schlumberger (Figure 3-7), the Valhalla region (area between the Valhalla wells) is likely to be in strike-slip stress regime ($SH_{min} < Sv < SH_{max}$). Image logs identified both wellbore breakouts (WBO) and perpendicular drilling induced fractures (DIF) simultaneously, indicating high horizontal stress anisotropy. The occurrence of both WBO and DIF in the vertical plane, where identified, eliminates reverse faulting as a potential current day stress regime
- the amount of tectonic stress is not known but further work can be done on the past completions to better understand and calibrate a mechanical earth model
- there is significant vertical heterogeneity within the Laurel Formation. Significant variations are noted in the static Young's modulus and unconfined compressive strength which can provide potential vertical frac barriers.

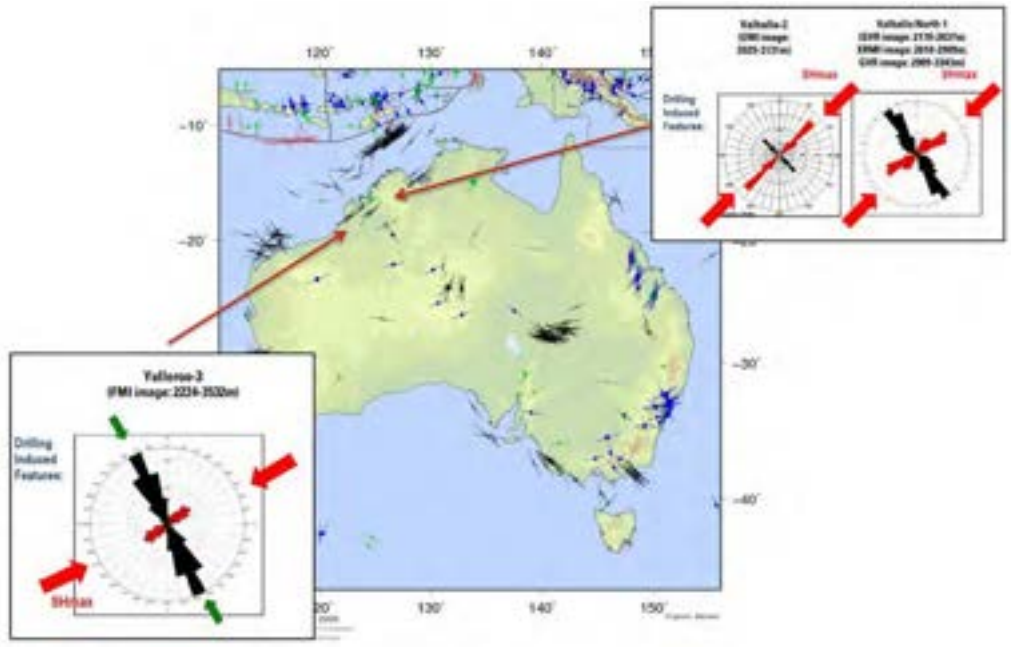

Figure 2-4: SH_{max} for three wells within the northern portion of the Canning Basin along with the world stress map. SH_{max} is north-east to south-west, and is consistent across this part of the Fitzroy Trough

Downhole geomechanical logs obtained on Valhalla North 1 and Asgard 1 wells and their interpretation and analyses are highlighted in the final well reports and not included here. In short, drilling induced tension fractures and borehole breakouts are common in the wells like Valhalla North 1 based on the image logs. The orientation of these features indicates a regime with a broadly north-east to south-west oriented present day maximum SH_{max}.

2.5 Future wells

As a part of the Well Management Plan development and the International Organization for Standardization (ISO) ISO 16530-1-2017 requirement, a prognosis will be prepared for each well location (Figure 2-5). Per the ISO, the prognosis provides a “description of the expected formations and fluids, pore pressures, formation strength and temperatures to be encountered, including their uncertainty” (ISO 2017). Furthermore, “the information should cover subsurface aquifers and hazards, faults and high-pressure stringers, i.e., pore pressure prediction, freshwater zone protection, stratigraphic prognosis, well orientation and length of penetration through production zone” (ISO 2017).

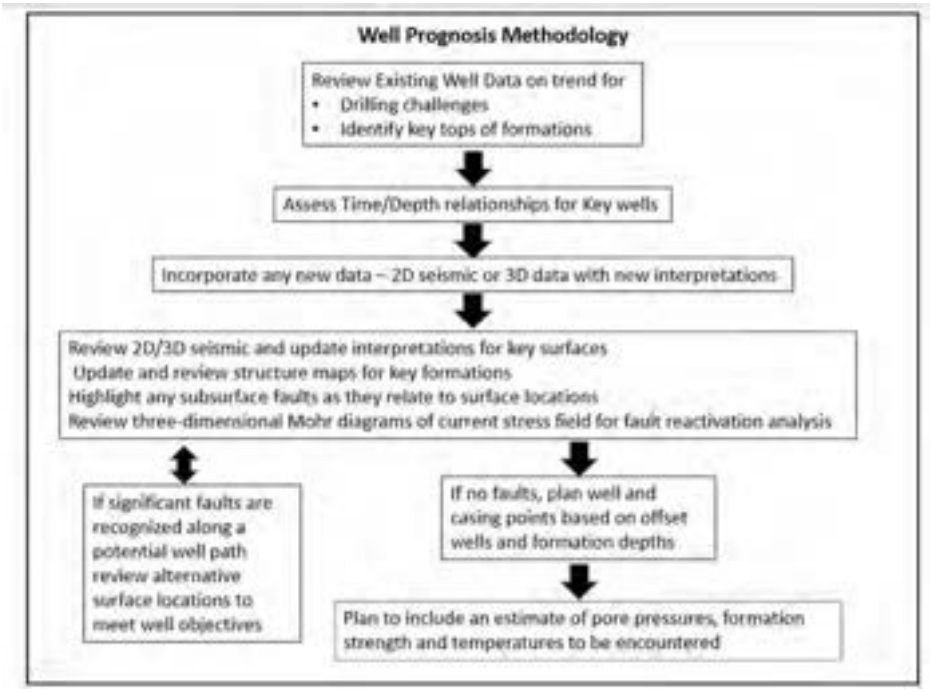

Figure 2-5: Well prognosis methodology

After drilling the future wells but prior to HFS, a workflow examining the key formations and zones is followed. Here stimulation models are produced to understand fracture height and lengths. Figure 2-6 highlights an example workflow that is likely to be followed through.

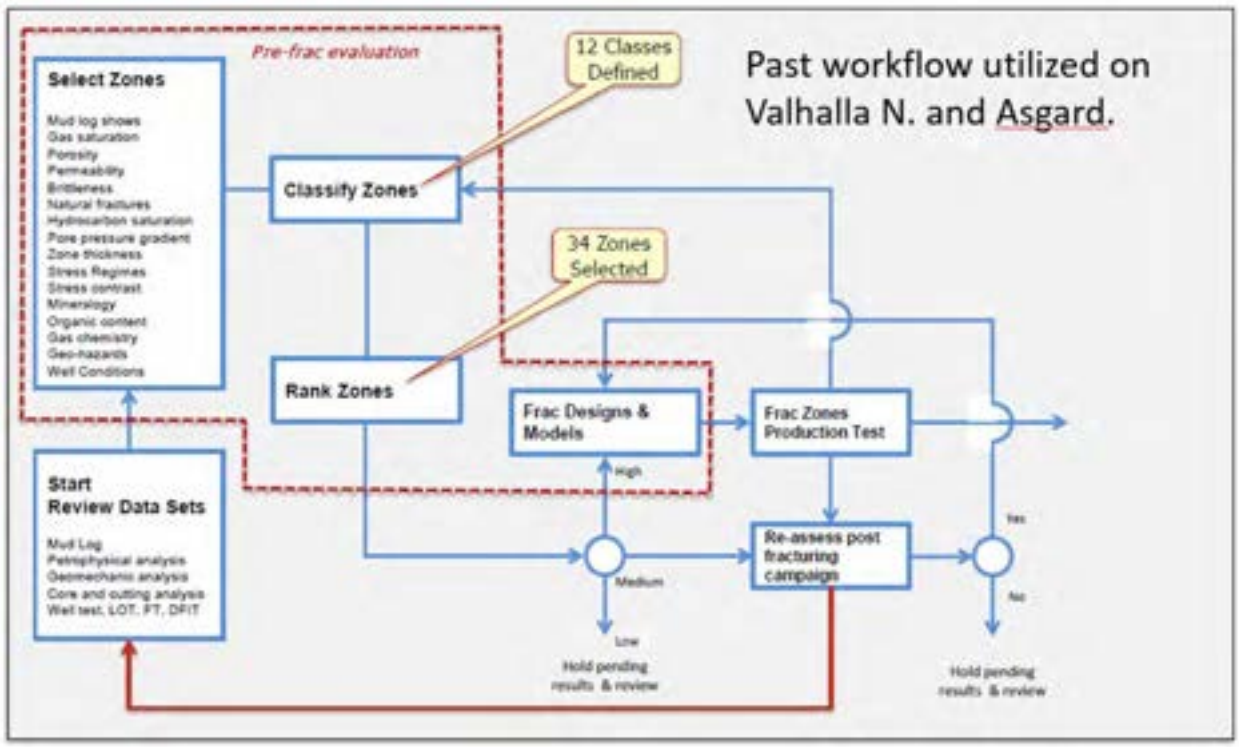

Figure 2-6: Example workflow for considering the zones to be tested for the HFS

A risk analysis is then reviewed for key HFS zones and utilises offset well geomechanical and geotechnical data. Such a risk analysis workflow used in the past is highlighted below in Figure 2-7.

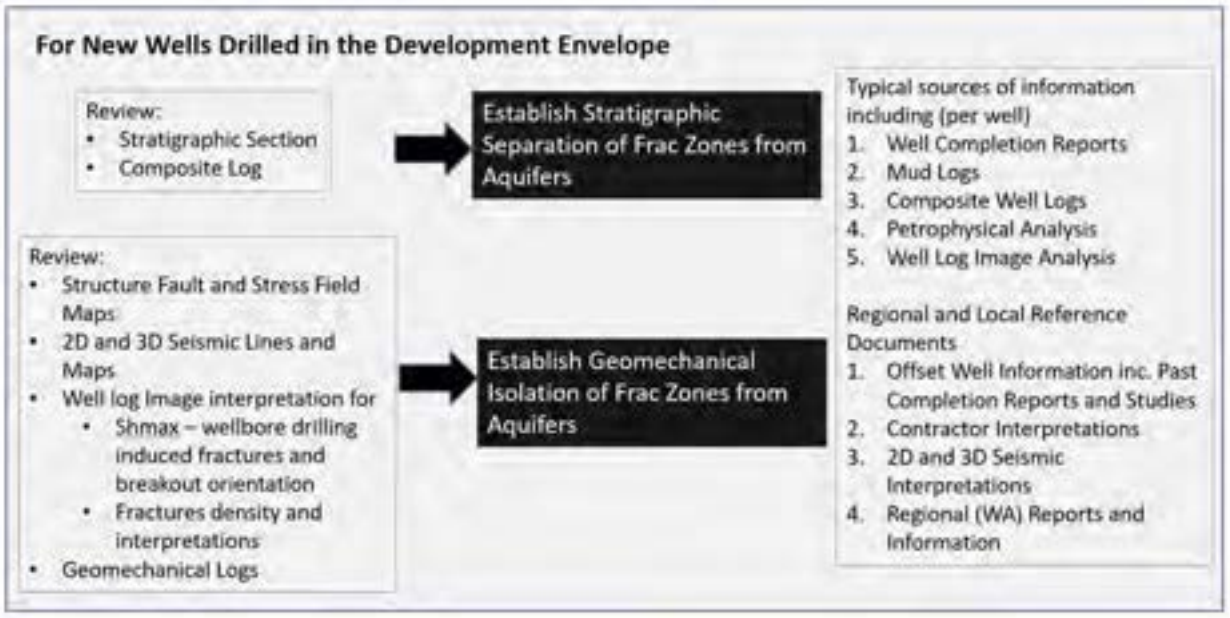

Figure 2-7: Example of data that is considered for a risk analysis for any HFS as it relates to the relationships between the HFS and aquifers

3 Identification of hydrologically active faults or fracture zones

Based on the observation that most wells drilled below the Anderson Formation shale contain hydrocarbons, it is believed that the shale within the Anderson Formation can be considered a seal. There is no conventional core in the nearest offsetting wells, but core in Yulleroo noted cemented fractures at depth.

Based on the current data from the Valhalla and Asgard areas, it is also likely that faults appear to be mainly sealing. Some faults do cut through to the near surface based on seismic data. There is some gas presence noted in the shallower Grant Group units in the Valhalla area but not encountered in the Asgard 1 well. It can be inferred that through geological time there has been some hydrocarbon migration into the shallower Grant Group. The industry has however not noted natural petroleum presence on the surface, thus suggesting that the regional faults are not significantly open and conductive. There is potential for open and conductive fractures within the Laurel Formation based on formation micro-imager data, however pressure data support an overpressured Laurel Formation section so hydrocarbons appear to be contained.

Prior to drilling, a WMP along with a well prognosis will be created to review the existing and future seismic data to ascertain and/or minimise drilling through significant faults.

3.1 Historical analysis

Buru Energy previously characterised the subsurface geology using the most recent well data that exists on EP 371 (Buru Energy 2013). A few key figures of this past work demonstrate the existing well data and their interpretation. BNR plans to follow a similar workflow for the wells associated with the Proposal.

The following interpretations can be made from Figure 3-1 to Figure 3-4, relating to the Valhalla North 1 area:

- the Valhalla North 1 well was drilled into the Lower Laurel Clastics. There are three or four down to the south-west normal faults within a few kilometres of the well. SH_{max} is north 50° east.
- the base of potential Grant Group aquifer (Betty unit) is located at 1,614 m. The highest planned stimulation considered was at 2,355 m in the upper Laurel Clastics (planned 741 m apart); the actual uppermost stage was at 2,827 – 2,872 m resulting in a separation from the Grant Group aquifer of 1,213 m.
- hydrocarbon saturation increases just below the Anderson Formation shale, which provides a seal for the gas as well as a fracture barrier
- the more quartz-dominated rock generally has a lower stress than the clay-rich rock. Carbonate units have an even higher stress.

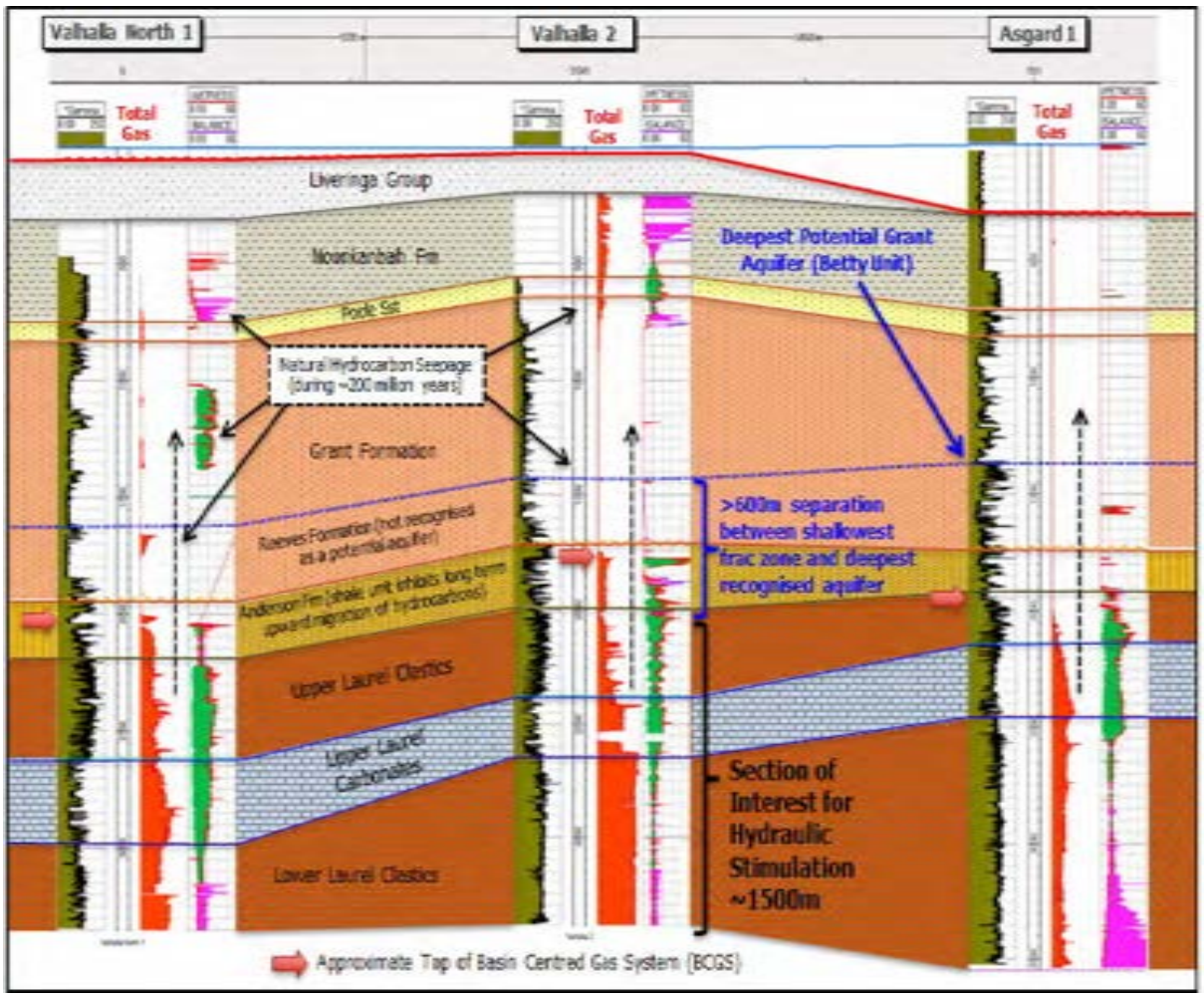

Figure 3-1: Relationships of the Laurel Formation to the overlying Grant and Reeves formations

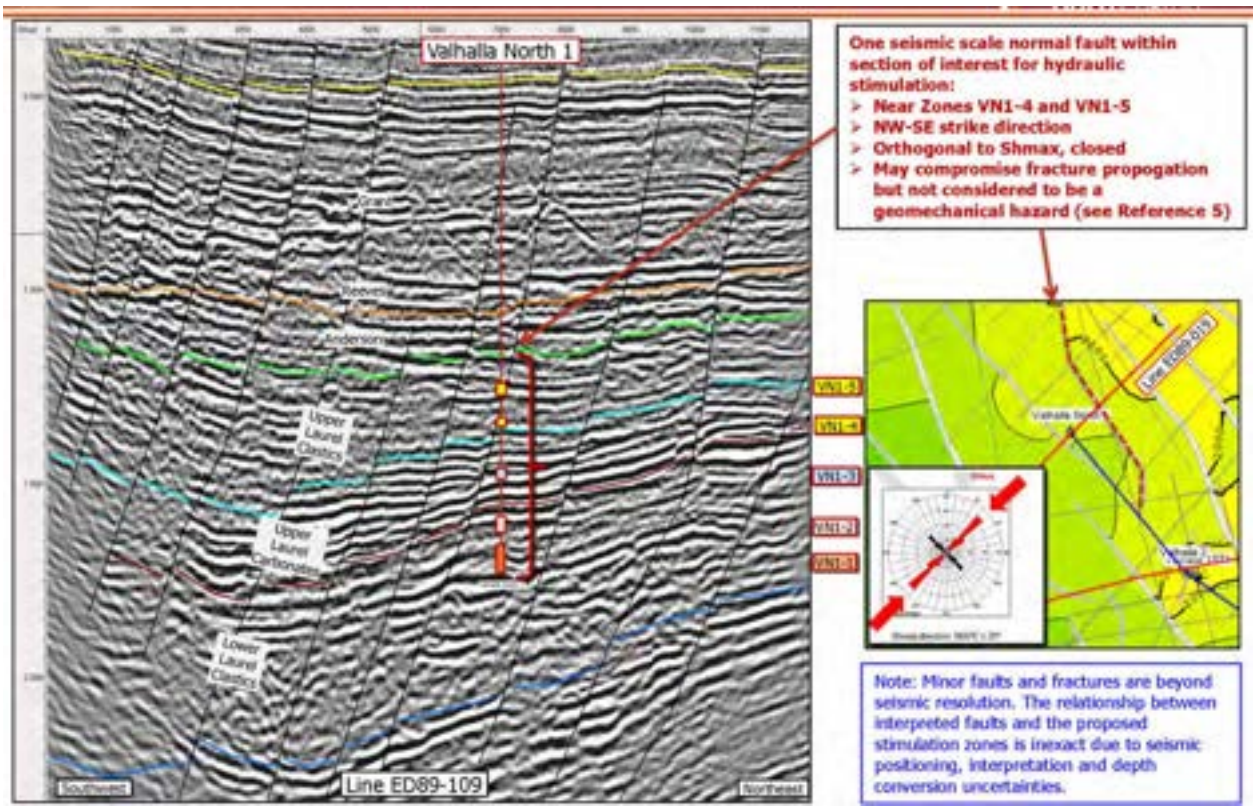

Figure 3-2: Valhalla North1 – 2D Seismic section showing the detail of the Upper Laurel Formation and faults as well as the relationship to the overlying Anderson, Reeves and Grant Group formations. The base of the Reeves Formation is noted as not a consistent reflector

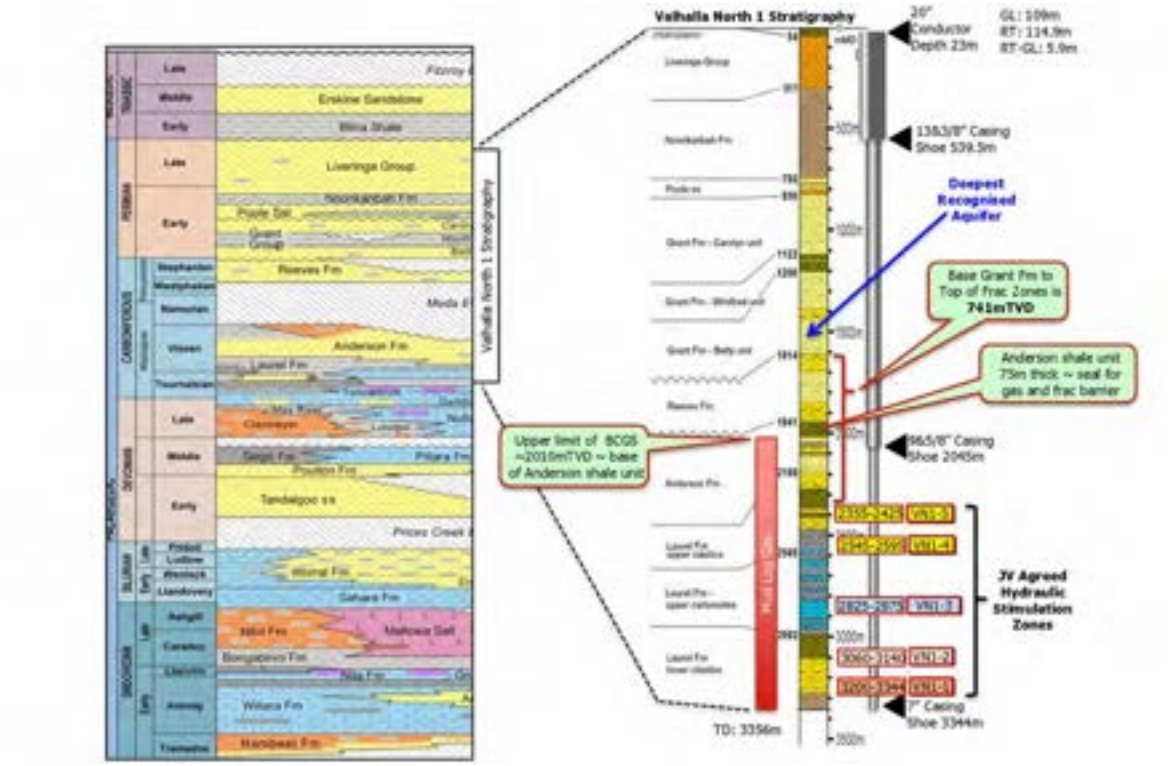

Figure 3-3: Valhalla North 1 stratigraphic section highlighting the Anderson Formation shale seal between the hydrocarbon bearing zones of the Anderson and Laurel Formations, and the Grant / Reeves sections above along with proposed hydraulic stimulation zones. Actual zones for the stimulations were deeper than the shallowest ones illustrated here

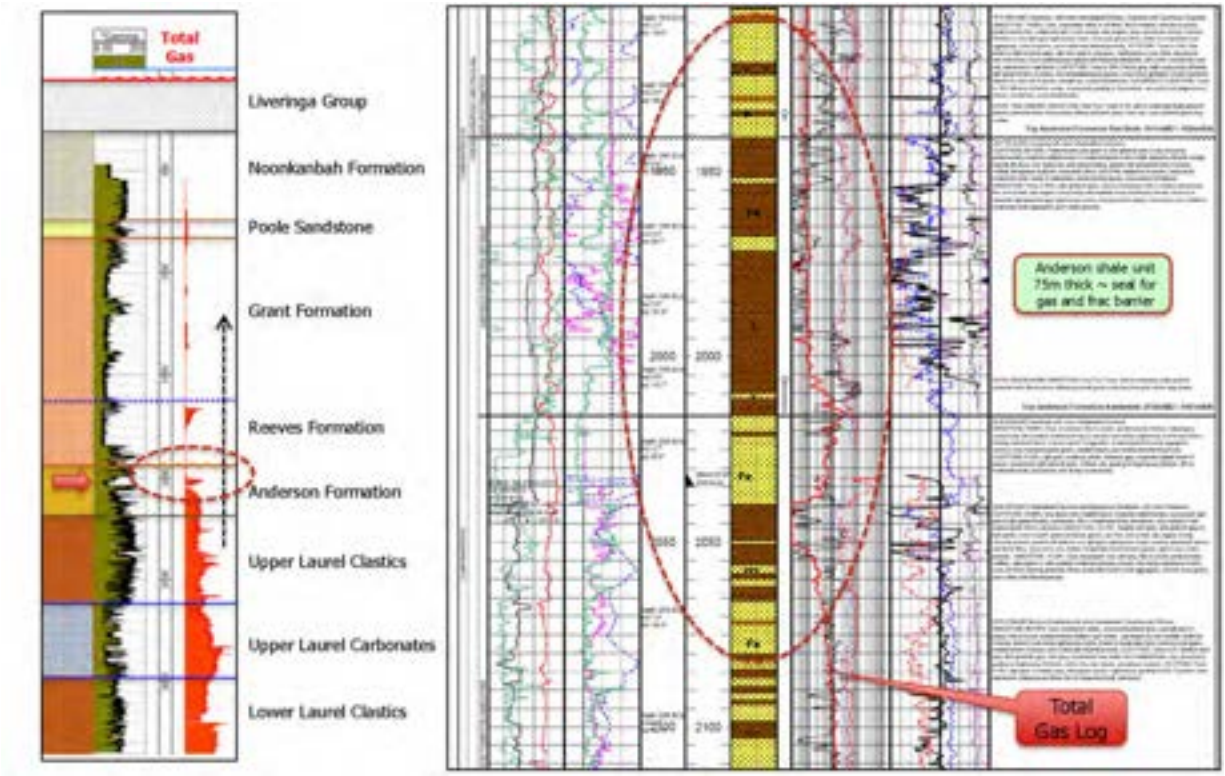

Figure 3-4: Composite well log for Valhalla North 1 showing the shale seal and the top of the gas section

From Figure 3-5 to Figure 3-7 below, the following can be interpreted for the Asgard 1 well:

- the deepest Grant Group layer is at 1375 m; the shallowest proposed stimulation was at 2045 m (actual shallowest stage was at 2567 m (planned distance from Grant Group – 670 m; actual distance was 1192 m)
- gas saturation increases in the upper Laurel Formation below the shale sealing Reeves Formation from the Anderson Formation
- SH_{max} is similar to the Valhalla area and is north-east to south-west.

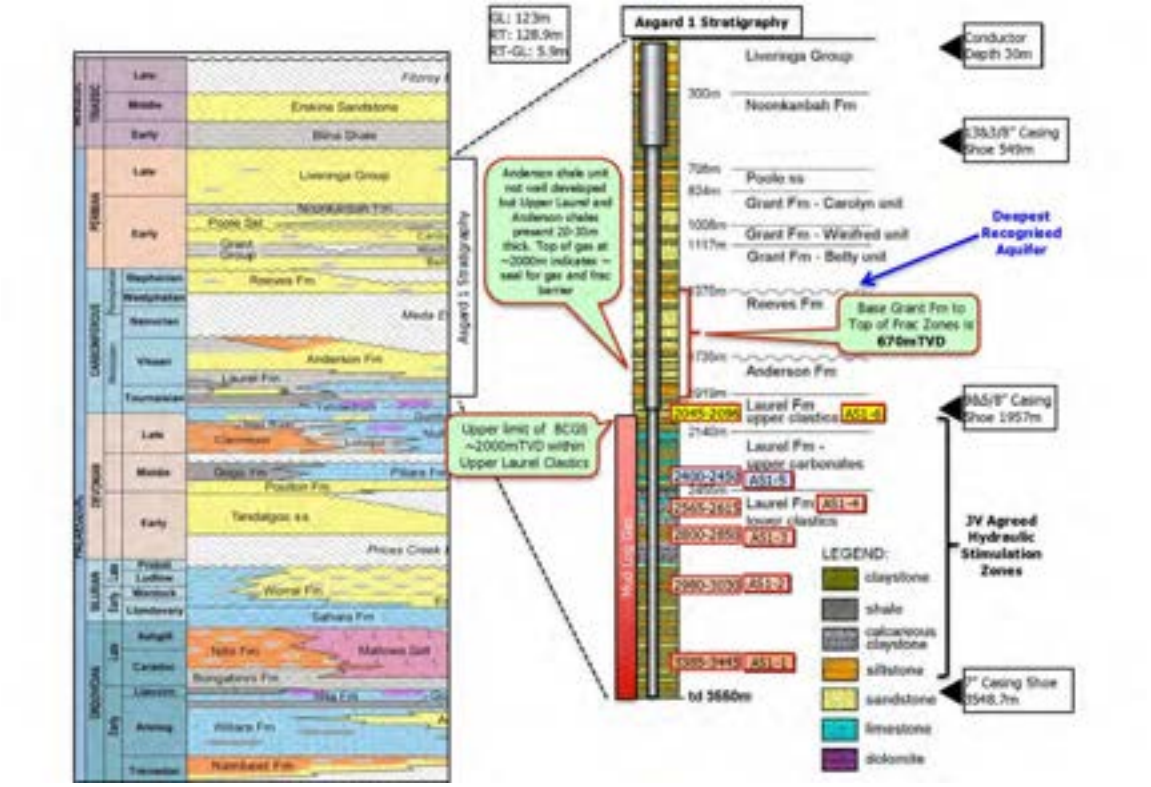

Figure 3-5: Asgard 1 stratigraphic section noting the deepest aquifer and the underlying siltstones of the Reeves and Anderson Formation shales and hydrocarbon zones within the Laurel Formation

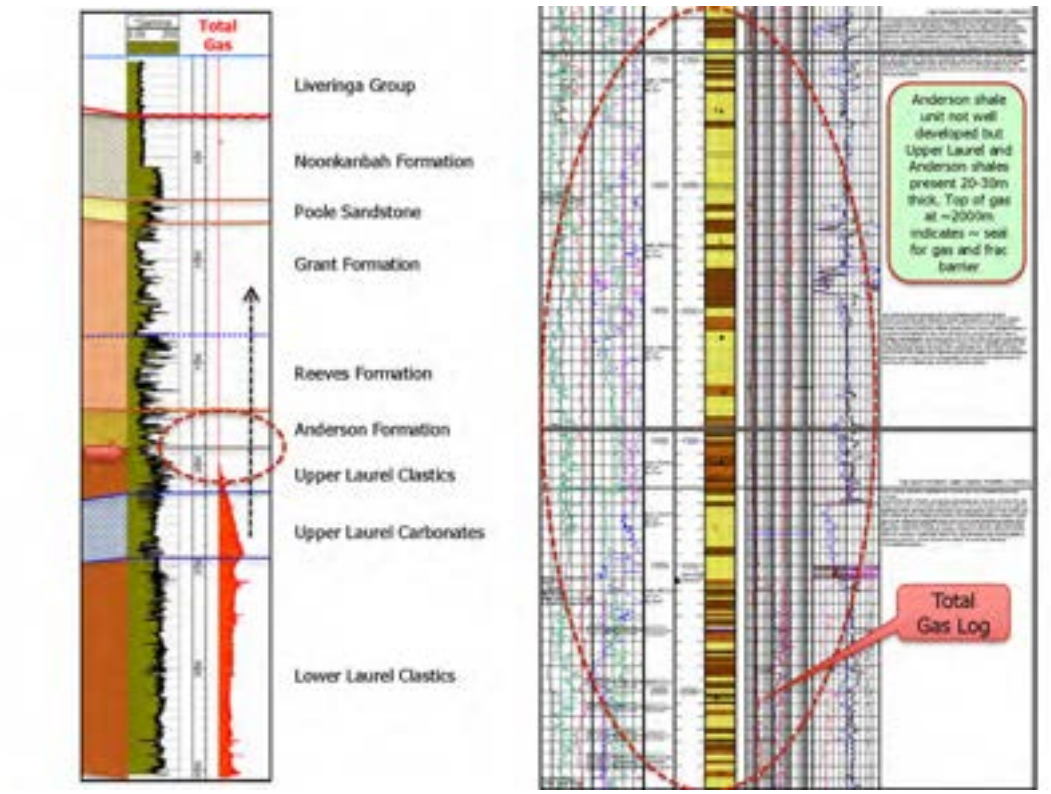

Figure 3-6: Asgard 1 composite well log showing the top of gas in relationship to the upper Anderson and Reeves Formations

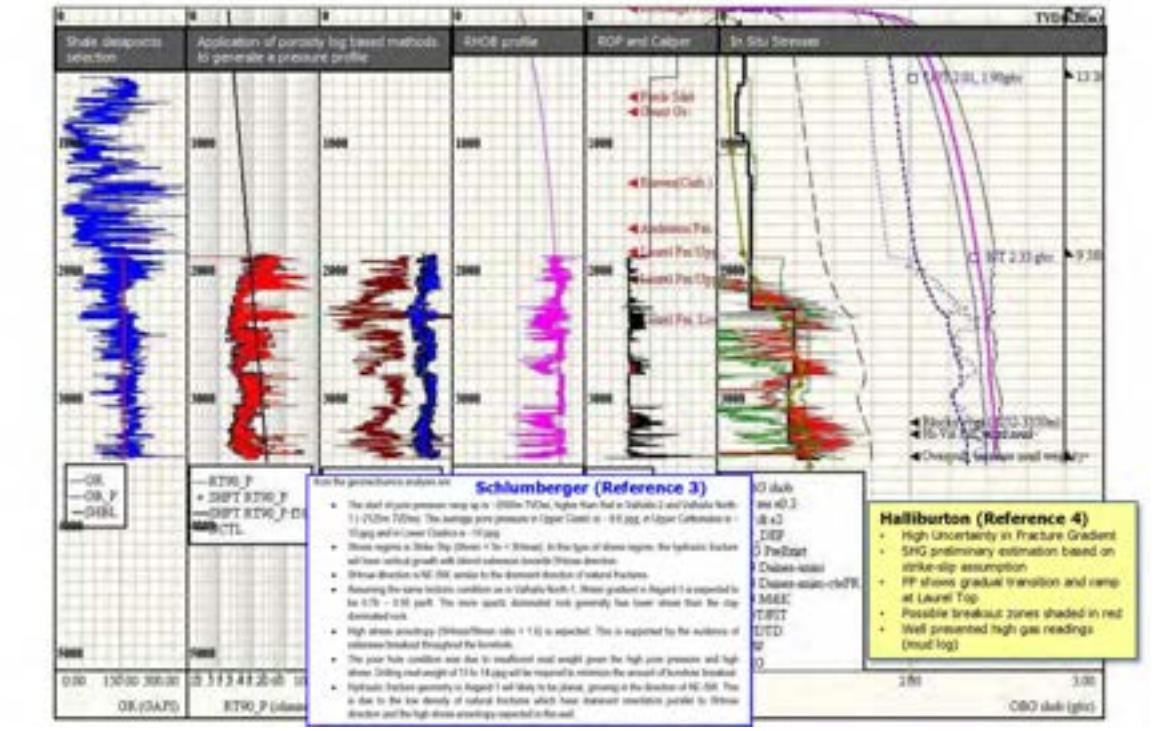

Figure 3-7: Asgard 1 geomechanical log from Haliburton as well as notes from Schlumberger

4 Assessment of well-seal effectiveness

Data of three petroleum wells (Table 4-1) drilled within the Development Envelope by the previous operator of EP 371 provides a detailed two-dimensional cross section of the formations located beneath the Development Envelope, shown in Figure 16.

Given the presence of trapped hydrocarbons in the lower Anderson and Laurel which are not significantly found above, along with evidence of overpressure below, BNR determined that the Anderson Formation provides a geological seal between the targeted Laurel Formation and shallower formations.

Data from these historical wells indicate that Anderson Formation is between 184 m and 279 m thick, this is similar to the thickness of the Kolkata shale present in the Perth Basin which also acts as a geological seal for the targeted formation.

Table 4-1: Subsurface formation data

Formation	Dominant lithology	Classification	Elevation – base of formation (m AHD)			Thickness	Total Dissolved Solids (mg/L)
			Valhalla 2	Valhalla North 1	Asgard 1		
Liveringa	Carbonate / shale	Minor aquifer, Aquitard	-84	-196	-171	84 to 196 m	500 to 12,400
Noonkanbah	Shale	Aquiclude	-441	-635	-579	357 to 439 m	550 to 800
Poole Sandstone	Sandstone and Shale	Aquifer or Aquitard	-524	-715	-695	80 to 116	300
Grant Group	Sandstone	Aquifer	-1,332	-1,499	-1,240	545 to 808	800 – 1,000
Reeves	Sandstone	Aquifer	-1,588	-1,826	-1,606	270 to 366	No data available
Anderson	Sandstone, siltstone, shale	Minor aquifer, Aquitard	-1,858	-2,105	-1,790	184 to 279	70,000 – 100,000
Laurel	Limestone, shale, siltstone and sandstone	Minor aquifer, Aquitard	<-3,350	<-3,241	<-3,400	1136 to 1610	70,000 – 100,000

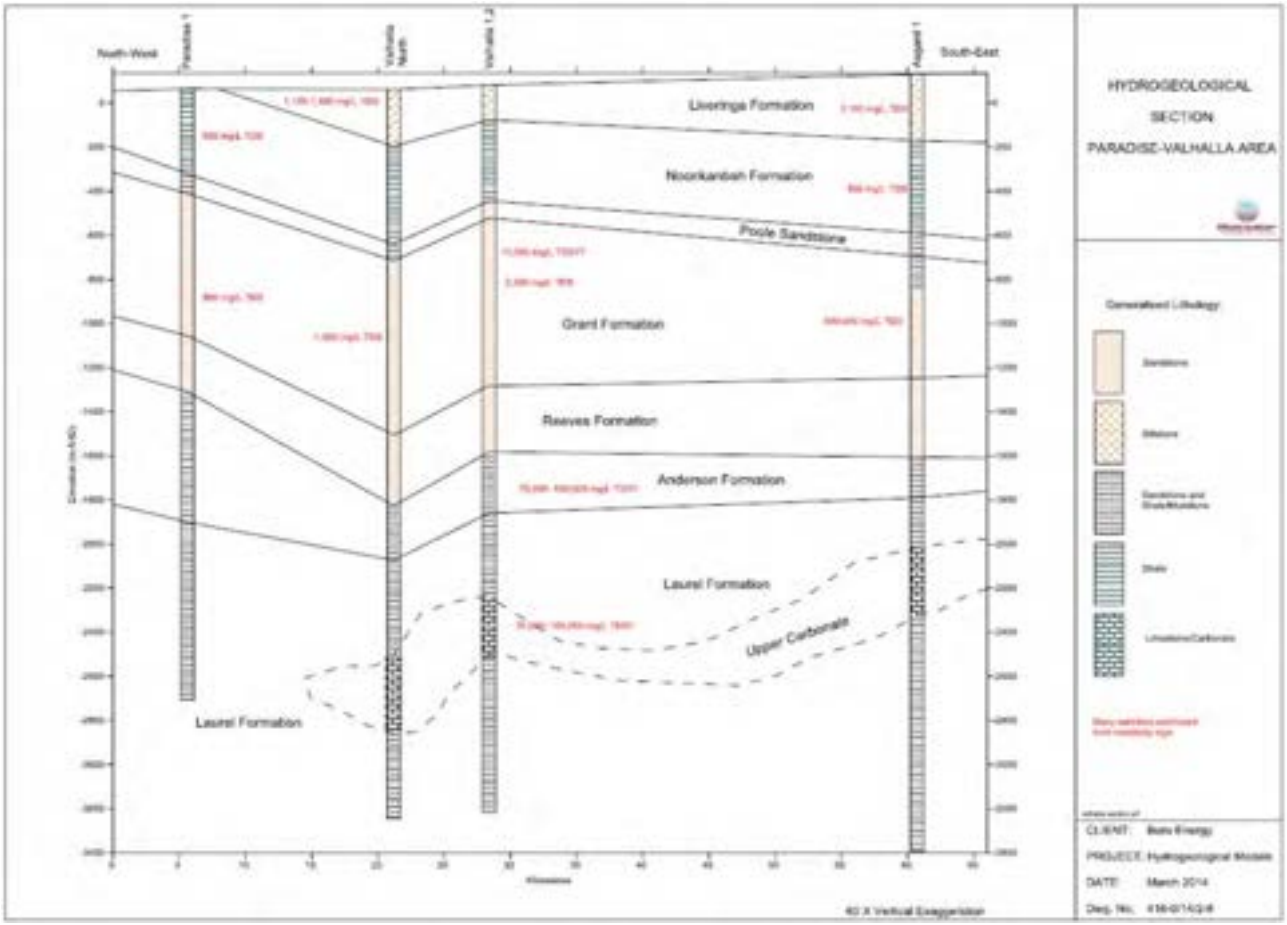

Figure 4-1: Hydrogeological cross section of the Valhalla and Asgard areas

5 Definition of potential high-risk zones

Currently this geotechnical risk assessment indicates substantially thick Grant Group and Poole Sandstone formations, along with the Reeves Formation section overlying the unconventional Laurel and Anderson Formations. Based on past drilling of the Laurel Formation section with no major drilling issues, BNR does not anticipate any significant high-risk zones directly related to drilling through the overall section. For the shallow formation section, through the aquifers, appropriate mud weight and casing design will be implemented to cover the shallow interval. For the deeper Laurel Formation section, BNR expects there should be little flow into the well during drilling operations over the hydrocarbon bearing intervals as the unconventional resources are noted as extremely tight with low permeability.

BNR has not noted any significant reverse faults providing juxtaposition of the Grant Group's potential aquifers adjacent to the Anderson or Laurel Formation sections in the downdip areas within EP 371.

The wellbore design and location will be optimised to minimise drilling through structurally weak geological zones that could shear and deform the well casing. The Canning Basin rocks on the Lennard Shelf are old. BNR does not anticipate drilling through salts or coals. Faults and a potentially weak shear zone surrounding them are the most likely weakest zone that may be encountered during the Proposal. It is our intention to not drill extensively through fault zones. Hydraulic stimulations in the proposed horizontal wells will be modelled prior to a stimulation and designed within the engineering tolerances.

BNR has not recognised any high-risk zones as such.

6 Expertise of current review

This geotechnical risk analysis has been prepared and reviewed by BNR using internal expertise.

6.1 Jay Moore, P.G

Chief Geoscientist, with over 24 years of diversified upstream oil and gas experience as an exploration and development geologist for companies in the United States (U.S.) such as Denbury, Encore Permian, XTO, BMOG). His experience includes prospect generation, planning, and drilling oversight of hundreds of vertical and horizontal wellbores in both conventional and unconventional plays (Wolfcamp, Bone Spring, Barnett Shale, Haynesville, Cotton Valley and others). Well versed in cross-discipline integration with experience in drilling, completion, and production operations.

6.2 George Witman

Vice President Drilling and Completions, with 22 years of upstream oil and gas experience, focused exclusively on high-efficiency development of U.S. unconventional resources including the Barnett, Eagle Ford, and Permian Basin. He managed EOG Resources' completions operations and water resources for the Permian Basin from 2016-2019. Responsible for a >$900 milliong annual completions budget, 6-8 operated frac fleets, and over 100 employees / contractors. Reduced completions costs by 29% and increased completions efficiency by 43% over a 3-year time frame. George holds a Bachelor of Science (B.S.) in Mechanical Engineering from Cornell University (Magna Cum Laude).

6.3 Mark Mueller

Drilling Supervisor after spending 7 years with BHP Billiton. He held roles in engineering and operations supervision across the drilling and completions function, and has planned and executed drilling projects in North American Shale, Australia, and the Gulf of Mexico. Mark holds a B.S. in Petroleum Engineering from Texas A&M.

6.4 Jon Holt

Director of Completions, with over 16 years of experience in the oil and gas industry. He spent 8 years with EOG Resources creating various completion strategies including: parent/child development, reservoir geomechanics evaluation, and exploration play design. Jon holds a B.S. in Chemical Engineering from Colorado School of Mines and an Master of Business Administration from University of Denver Daniels School of Business.

6.5 Rob Hull

Geophysical Consultant, with 27 years upstream oil and gas experience as a geotechnical specialist (for companies such as Pioneer Natural Resources, Maxus Energy, YPF- Repsol). He is a leader in 3D seismic, microseismic, geomechanics and fibre optics. He has experience in the unconventional Permian Basin, and Barnett Shale as well as conventional plays of West Africa, South Africa, and Indonesia. Rob holds a B.S. in Geology from the University of Rochester and a Master of Science. in Geosciences from the University of Texas at Dallas.

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Annex A. Early warning mechanism

The purpose of implementing an early warning mechanism process is to enable efficient and consistent decision making when responding to anomalous seismic events during HFS operations.

1. Overview

Microseismic monitoring is the passive observation (magnitude and location) of very small-scale ground movements or stress drops which can occur during HFS activities. Unlike traditional 3D seismic technologies, which measure acoustic reflections from an energy source, microseismic monitoring is a passive method, meaning it listens and measures the occurrence of natural and man-made seismic events within the earth. Passive methods provide a continuous 4D record of seismicity in the monitoring area, rather than individual snapshots in time obtained by conventional 3D seismic methods. These micro seismic events, often with magnitudes less than zero, are too small to be felt on the surface, but can be recorded by sensors called geophones or seismometers.

A microseismic event can occur from a natural build up and release of stress in the subsurface. Typically, as compaction and sedimentary processes take place within the earth, unequal distributions of lithology and fluids occur which can result in natural slippage and stress release along discontinuities or faults. Seismographic networks on the surface locate these natural slippages through time, highlighting the locations of these earth movements. Significant earth movements often greater than a magnitude of 3.5 on the Richter scale can be felt on the surface but seismometers can detect events that are far weaker. In oil and gas operations, during a hydraulic stimulation we modify the local pressure and stress at a given injection point along the well to create a hydraulic fracture. The hydraulic fracture opens up against the minimum horizontal stress direction and propagates away from the wellbore. As the fluid and pressure increase, the fracture forms and extends into the unconventional shale providing a conduit of hydrocarbons back into the well. The hydraulic fracture during its formation introduces local stress changes, which may generate microseismic events that can be monitored with a sensitive network of seismometers. These events can be mapped as the HFS operations progress. After pumping stops, the fractures begin to close and the localised fluid begins to diffuse in the host rock. Minor stress redistributions can further occur generating a falling off of microseismic events through time.

Microseismic monitoring has the ability to tell us the time, location and magnitude of microseismic events. During hydraulic stimulation, microseismic monitoring can be used to determine the fracture geometry and azimuth, identify out-of-zone events, evaluate fracture complexity and intensity, optimise injection strategies and staging, estimate stimulated reservoir volume, understand fracture development and stimulation effectiveness.

Microseismic monitoring utilises microseismic monitoring stations arranged in an array around the well to be stimulated. Receivers can be placed in different location, such as on the surface, buried under shallow earths, in shallow monitoring wells (10-30 m below ground level) or in deep boreholes. Depending on the design and purpose, a typical microseismic monitoring station consists of a sensor, data acquisition unit and radio (for real time).

2. Monitoring

The CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) is undertaking setting up a baseline study for the northern Canning to characterize the current natural seismic activity for the basin (GISERA 2021–). The collection of baseline information is important to help distinguish between natural and man-made events (e.g. quarry blasts or oil and gas extraction activities). Currently there are national catalogues available for the Canning Basin showing past natural earthquake activity. This GISERA work with an additional fourteen seismometers will enhance the understanding of natural earthquakes. The current national sparse network of receivers (currently three in the northern Canning Basin) cannot detect and locate events less than a magnitude of 2.5 within the basin. The new network should resolve events down to a 1.5 magnitude. This project will be set up from 2021 to 2025 and is currently 10% complete (GISERA 2021–). At least one monitoring station is proposed to be located in EP 371. GISERA notes that "increased seismic activity associated with hydraulic fracturing is an area of community concern and this baseline study will distinguish any potential increase in seismic activity due to planned gas extraction operations from other

seismic sources" (GISERA 2021–). Furthermore, this research addresses recommendations from the 2018 Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia (Independent Scientific Panel Inquiry 2018).

It should be noted that the Development Envelope is located in a remote area of the Canning Basin. There are no inhabitants within the Development Envelope as well as no significant man-made structures. Hundreds of natural earthquakes have been recorded in the Canning Basin in the past, with at least one 6.6 magnitude event occurring off of Broome in 2019. With the addition of additional instrumentation by GISERA there will likely be a significant jump in the number of weak natural earthquakes that can be detected within the basin.

2.1. Timing of monitoring

Given GISERA's efforts for the basin and locating a seismometer within EP 371 prior the Proposal's stimulations, BNR does not anticipate needing substantial additional baseline information. The GISERA data should produce a catalogue of the naturally occurring low-level events over multiple years. BNR does plan on recording some additional baseline information at an even lower magnitude than GISERA, however over a limited time around HFS. The GISERA work utilising standard seismometers can record for months or years prior to the shorter-term local collection of microseismic events that BNR will record. Prior to the deployment of surface HFS equipment, BNR will set up a monitoring program to record events that might occur down to a magnitude of around -1 Richter local magnitude (ML). The scope of microseismic monitoring during the different phases of the HFS operations may involve different methodologies. An example of proposed monitoring program is provided in Table A.

Table A: Example of microseismic monitoring during the different phases of HFS operations

	Proposal phase		
Location of loggers	**Baseline**	**Operations**	**Post-operations**
Surface – GISERA Study	Deployed around the northern Canning with 14 seismometers over multiple years		
Surface – BNR	Array of typically 3 to 5 seismometers around the well to be stimulated, usually for 3-5 days prior.		
Post hole – BNR	Array of typically 3 to 5 seismometers around the well to be stimulated, usually for 3-5 days prior.		

2.2. Project set-up

2.2.1. Objective and initial short baseline program

The GISERA Western Australian surface seismometer program (GISERA 2021–) should be sufficient to understand events down to a 1 (ML). BNR will set up a short-term baseline program to detect and identify background levels of microseismic activity should these levels exist around the wells prior to HFS operations occurring. The array utilised should record down to a -0.5 to -1 ML and be more than sufficient for any induced events. This same array will record events during and after the stimulation for a short period. Depending on operations and logistics, BNR may maintain the network to record a longer duration of the baseline and post operations.

2.2.2. Monitoring stations

Typically, between 3 to 5 surface seismometers may be arranged around the well to be stimulated and may be situated in a low noise environment within a few kilometres of the surface location. Some post hole seismometers may also be situated away from the stimulation.

2.2.3. Recording

Data will be stored internally on data loggers. Data will be retrieved periodically for analysis. Given the short time intervals, most data will be transmitted to a base station via radio as will occur during the HFS operations.

2.2.4. Outputs

Results of the short term baseline microseismic monitoring program along with the GISERA data will be used as inputs into the operational monitoring program and can also be used for comparative purposes during later analysis of microseismic data.

2.3. Operations during HFS

2.3.1. Objective

The objectives are to:

- collect information on microseismic events during HFS operations
- provide data for the monitoring of hydraulic fracture development in real time.

2.3.2. Monitoring stations

A variety of methods can be used to monitor microseismicity during HFS operations. Between 3 to 5 surface seismometers may be set up, and up to 10 post hole powered downhole seismometers may be arranged around the well site at depths depending on soil type, level of detection desired, along with operations capability. Seismometers may also be buried in shallow soil away from the well site.

All sensors will be connected into a radio array network which will broadcast to the microseismic office. Arrays will be tested to ensure they are functional prior to starting pumping.

2.3.3. Recording and processing

Events greater than a certain magnitude (to be determined from baseline data) will be sent directly to the microseismic office on the well site to be processed in real time (refer to Section 2.3.3.1). Events below this threshold will be stored on internal data logger for later processing.

2.3.3.1. Real time processing

The microseismic office will be located at the central well site. This office will contain the central recording facility for the real time monitoring of the fracture stimulation. Incoming data will be analysed by geoscientists to assess the real time propagation of the stimulation. Collected information will then be fed back into the frac data van and correlated against the pumping rate.

2.3.3.2. Management response

A traffic light assessment tool (stop light system) will be developed to risk assess and ensure safe downhole fracture operations, incorporating the magnitude of events from the seismometer array. If thresholds are exceeded during stimulation activities, the operator will have various methods to respond including pausing the stimulation, lowering pressure, injection rates, and volumes as well as skipping a stage.

2.3.4. Outputs

All data will be stored and downloaded for post-operations analysis. Post-operations analysis will examine the data at a higher sampling rate and lower event threshold to ensure no microseismic events were missed during the real-time operation.

Analysis of continuous data collected during the program will be undertaken following the completion of operations. This analysis will include a review of all events along with a review of all waveform data and retriggering of events to see if events were missed. This report will provide an in-depth review of all events recorded prior-to, during and following the hydraulic stimulation, and will be correlated against the pump rates to understand the nature and lateral continuation of HFS activities. The results learnt from the microseismic program implemented during the well monitoring will then be applied to future programs.

Outputs from post processing will consists of copies of all extracted event waveforms, event pick files, event locations files, catalogue of events, updated models and stations corrections, plots of events, and a final report. The following interpretive products might also be developed from the microseismic monitoring program:

- basic engineering report of the interpreted fracture geometry

- advanced engineering report incorporating basic geophysical analysis of sensitivity and accuracy to interpret fracture geometry and evaluate the HFS
- basic geophysical processing and quality control report describing the workflow employed and corresponding data accuracy and confidence attribute
- advanced processed report described the workflow and corresponding interpretation.

2.4. Post-operations

2.4.1. Objective

The objective of post-operations monitoring will be to collect information on microseismic events following the HFS program as the stress is released from the geological profile. Typically, there are few events after pumps shut down with the majority occurring within a few hours of the end of operations.

2.4.2. Monitoring stations

Using the same equipment that was used during the stimulation, the data will be recorded post stimulation shut down for a short period typically on the order of a few days.

2.4.3. Recording

Data will be stored internally on data loggers and picked up at decommissioning. Should multiple stimulations take place over a short period of time, the recording stations will likely be maintained and be operational for multiple weeks or months. Data will be transferred to the central office via radio network or retrieved on internal storage devices after the operations are complete for analysis.

2.4.4. Outputs / Reporting

The outputs from post processing will include a report comparing microseismic activity during HFS operations to microseismic activity before and after operations.

Appendix C. Valhalla Flora and Fauna Survey Report 2021

Valhalla Flora and Fauna Survey

Bennett Resources Pty Ltd

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Template 2.8.1

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Abbreviations

Abbreviation	Description
ALA	Atlas of Living Australia
BAM Act	State *Biosecurity and Agriculture Management Act 2007*
BC Act	State *Biodiversity Conservation Act 2016*
Bennett Resources	Bennett Resources Pty Ltd
BoM	Bureau of Meteorology
CLUSTER	Hierarchical Clustering
cm	centimetre
DAFWA	Department of Agriculture and Food Western Australia
DAWE	Department of Agriculture, Water and the Environment

Abbreviation	Description
DBCA	Department of Biodiversity, Conservation and Attractions
DPIRD	Department of Primary Industries and Regional Development
DRF	Declared Rare Flora
ELA	Eco Logical Australia
EN	Endangered
EP Act	State *Environmental Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
ESD	Environmental Scoping Document
ha	hectare
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessment
kg	kilogram
km	kilometre
m	metre
M	Migratory
mm	millimetre
OS	Other specially protected species
P	Priority
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
PRIMER	Plymouth Routines in Multivariate Ecological Research v6
The Proposal	The Valhalla Gas Exploration and Appraisal Program
RE	Range Extension
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SIMPER	Similarity Percentages
SIMPROF	Similarity Profile Analysis
T	Threatened
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
VU	Vulnerable
WA	Western Australia
WAH	Western Australian Herbarium
WAM	Western Australian Museum

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Executive Summary

Bennett Resources Pty Ltd (Bennett Resources) is proposing to undertake the Valhalla Gas Exploration and Appraisal Program located approximately 51 kilometres northwest of the townsite of Fitzroy Crossing (Shire of Derby-West Kimberley) in the Dampierland Bioregion in the State of Western Australia. Eco Logical Australia was commissioned by Bennett Resources to undertake a Detailed and Targeted flora and vegetation survey and a Basic fauna survey of the Project Area, which consists of access tracks, camp locations of proposed well pads (the Disturbance Footprint; 112.46 hectares), and an additional 15.69 hectares of alternative tracks (Additional Survey Area; 128.15 hectares total).

A desktop assessment of the Project Area was undertaken to inform local and regional context, to assess for the potential presence of conservation significant species and vegetation associations, and to inform the flora and fauna survey in terms of landform, vegetation associations, fauna habitat and accessibility. A Detailed and Targeted flora and vegetation survey and a Basic fauna survey were conducted by Eco Logical Australia from 3 to 10 March 2021. An additional supplementary survey was conducted from 25-27 May 2021.

A total of 235 flora species representing 54 families and 130 genera were recorded from the 64 quadrats established within the Project Area. Average species richness per quadrat was 27 species, ranging from a low of 7 species in ELA57 to a high of 53 species in ELA39. A species accumulation curve determined that the number of flora species recorded represents approximately 91.7% of the species potentially present within the Project Area. Families with the highest number of species included Fabaceae (42 species), Poaceae (40 species) and Malvaceae (18 species). *Acacia* was the best represented genus throughout the Project Area with seven taxa recorded.

No Threatened flora listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* or the State *Biodiversity Conservation Act 2016* were recorded within the Project Area. One Priority flora species, *Nymphoides beaglensis* (listed as Priority 3 by the Department of Biodiversity, Conservation and Attractions), was recorded within the Project Area. This species was recorded from eight point-locations totalling 112 individuals, all of which were found within seasonally inundated depressions within the CbEc vegetation community. A total of four flora species were recorded as range extensions within the Project Area, namely *Cajanus latisepalus*, *Lindernia chrysoplectra*, *Lindernia clausa* and *Tephrosia remotiflora*.

A total of nine introduced flora (weed) species were recorded within the Project Area, one of which **Calotropis procera*, is listed as is listed as a Declared Pest – s22(2) under the State *Biosecurity and Agriculture Management Act 2007*. **Calotropis procera* was recorded within five quadrats in the Project Area, namely ELA20, ELA33, ELA35, ELA59 and ELA60.

A total of 13 vegetation communities were delineated and mapped within the Project Area, generally comprising broad mixtures of *Adansonia gregorii*, *Corymbia* and *Eucalyptus* spp., *Atalaya hemiglauca, Bauhinia cunninghamii* and *Erythrophleum chlorostachys* woodland over mixed *Acacia*, *Grevillea*, *Hakea* spp. shrubland over *Triodia* spp. hummock grassland and *Aristida*, *Eriachne*, *Eragrostis* and *Sorghum* spp. tussock grassland. Landforms recorded across the Project Area comprised sandy clay to light clay flats and gentle slopes, dune slopes, crests and swales and open depressions and creekline communities. None of the vegetation associations delineated within the Project Area were inferred to represent any

known or potential conservation significant communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the State *Biodiversity Conservation Act 2016* or by the Department of Biodiversity, Conservation and Attractions.

The Project Area contained three broad fauna habitat types, namely Fauna habitat 1: Mixed open woodland over grassland on sandy clay flats and slopes, Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests and Fauna habitat 3: Eucalypt open woodland and mixed shrubland on closed depression and creekline. A total of 75 fauna species were recorded during the field survey. This number comprised of 52 birds, five mammals, eight reptiles and ten invertebrates.

Secondary signs (i.e. diggings) of the Greater Bilby (*Macrotis lagotis*), listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the State *Biodiversity Conservation Act 2016*, were recorded within the Project Area at four locations in the south-east of the Project Area within Fauna habitat 2.

A total of two flora species considered as Aboriginal significant bush foods were recorded within the Project Area, namely *Adansonia gregorii* (Boab) and *Carissa lanceolata* (Conkerberry). Within the Project Area, boab trees were recorded as a dominant or associated species within five of the 14 vegetation communities described, at a <5% cover. Of note was one particularly large Boab tree occurring across a portion of the track leading to the Midgard well site (m 685634E; m 7992864N). Conkerberry was recorded as a dominant or associated species within ten of the 14 vegetation communities described, at a <5% cover.

A total of four fauna species considered as Aboriginal significant bush foods were recorded within the Project Area, namely *Ardeotis australis* (Australian Bustard), *Osphranter rufus* (Red Kangaroo), *Varanus gouldii* (Sand Goanna) and *V. panoptes* (Yellow-spotted Monitor). Australian Bustard was recorded from one location within the Project Area (m 683743E; m 7992977 N), however is likely to utilise most habitats found throughout the Project Area for foraging. Red Kangaroo (*Osphranter rufus*) was recorded from scats throughout the Project Area and spotted in the distance at various locations and is likely to utilise most habitats found throughout the Project Area. During the field survey, both *Varanus gouldii* (Sand Goanna) and *V. panoptes* (Yellow-spotted Monitor) were spotted several times sunbaking along tracks. These species are likely to utilise all fauna habitats found throughout the Project Area for burrowing and/or foraging.

1. Introduction

1.1. Project background

Bennett Resources Pty Ltd (Bennett Resources) is proposing to undertake the Valhalla Gas Exploration and Appraisal Program (the Proposal) located approximately 51 kilometres (km) northwest of the townsite of Fitzroy Crossing (Shire of Derby-West Kimberley) in the Dampierland Bioregion in the State of Western Australia (WA; **Figure 1**).

The Proposal was initially referred to the Environmental Protection Authority (EPA) under Section 38 of the State *Environmental Protection Act 1986* on 25 June 2020 under the title: EP 371 Laurel Gas Exploration and Appraisal. The EPA set the level of assessment of the initial referral to a Public Environmental Review. On 3 December 2020, Bennett Resources formally terminated the assessment of the Proposal, and on 24 December 2020 referred to the EPA a revised program under a new Proposal title: Valhalla Gas Exploration and Appraisal Program.

In July 2021, the EPA Services drafted an Environmental Scoping Document (ESD) that details the baseline environmental studies required to form part of the Environmental Review Document.

As detailed in the ESD, Bennett Resources is required to undertake a biological (flora, vegetation and fauna) assessment of the proposed well sites, access tracks and camps within the Project Area.

1.2. Scope and objectives

Eco Logical Australia (ELA) was commissioned by Bennett Resources to undertake a Detailed and Targeted flora and vegetation survey and a Basic fauna survey of the Project Area, which consists of access tracks, camp locations of proposed well pads (the Disturbance Footprint; 112.46 hectares [ha] total), and an additional 15.69 ha of alternative tracks (Additional Survey Area; 128.15 ha total; **Figure 1**). It is noted that the Project Area (described above) is located inside a broader Development Envelope, which has been included in relevant mapping for general context. Results discussed in this report relate specifically to the Project Area only.

More specifically, the scope of work was to conduct:

- A desktop assessment of the Project Area to inform local and regional context, to assess for the potential presence of conservation significant species and vegetation associations, and to inform the flora and fauna survey in terms of landform, vegetation associations, fauna habitat and accessibility;
- A Detailed and Targeted flora and vegetation survey undertaken in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016);'
- A Basic fauna survey undertaken in accordance with the EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (2020);
- Preparation of a report combining findings of the desktop assessment and survey findings, including relevant mapping; and
- Provision of a spatial data package prepared in accordance with the Index of Biodiversity Surveys for Assessment (IBSA).

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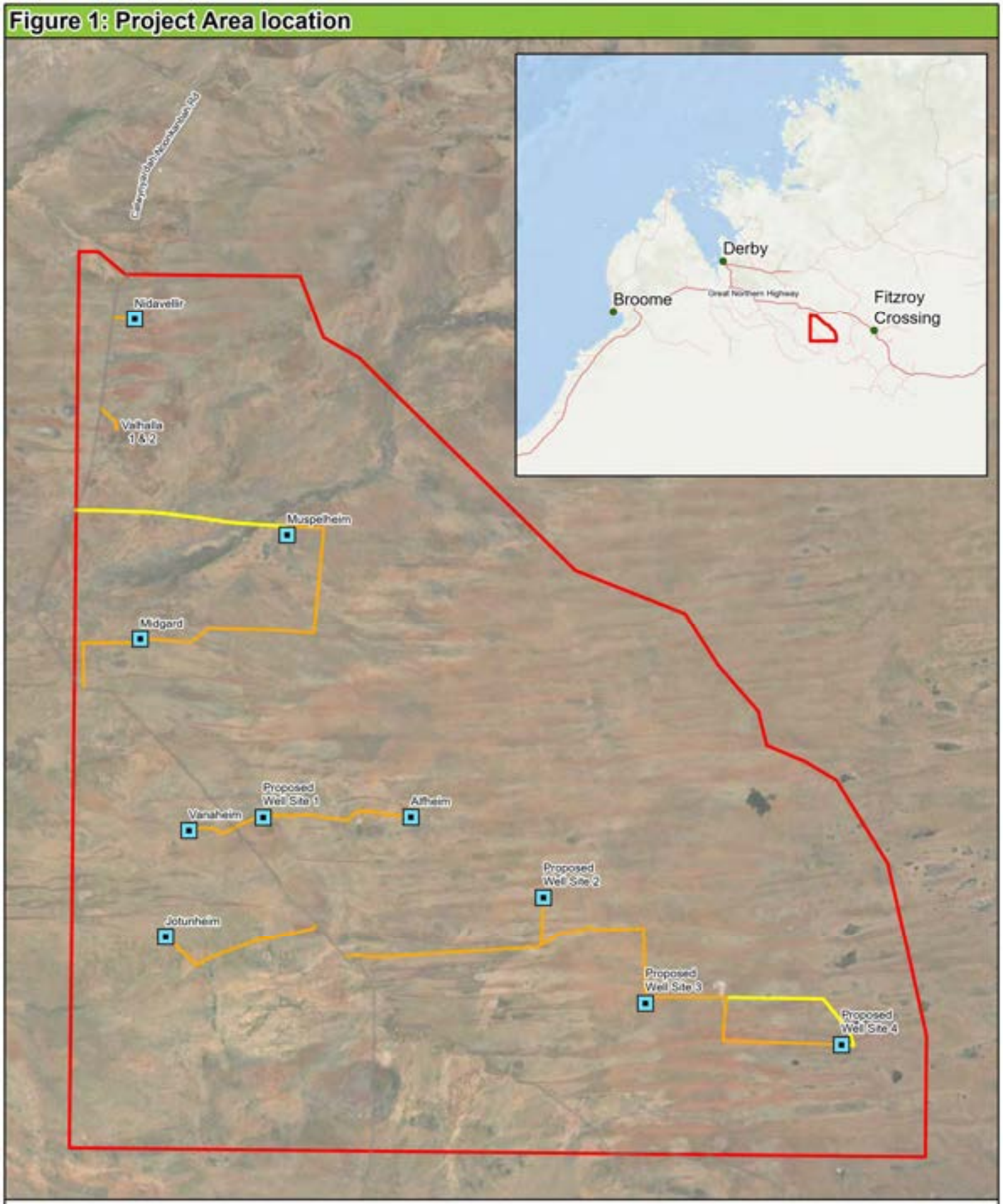
Figure 1: Project Area location



Legend

- Development Envelope

Project Area

- Proposed Well Site
- Proposed access track / camp locations
- Additional Survey Area

0 1.5 3 6
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 51

N

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Prepared by: DD-17692 Date: 16/07/2021

2. Environmental setting[1]

2.1.1. Climate

The Project Area is located in the Dampierland bioregion of WA, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA; Department of Agriculture, Water and the Environment [DAWE] 2021a). The Dampierland bioregion has a semiarid to tropical monsoonal climate (Bastin and the ACRIS Management Committee 2008).

Based on rainfall data from the nearby Bureau of Meteorology (BoM) Liveringa Station weather station (station number 3100, located approximately 20 km northwest of the Project Area; rainfall 2001-current), the area receives an average annual rainfall of 751.4 millimetres (mm), with most rainfall occurring during the months of December, January and February (123.1 mm, 222.3 mm and 175.5 mm, respectively; BoM 2021; **Table 1**).

In the 12 months preceding the field survey in March, the area received a total of 1,082.2 mm, which is above the long-term average. In the three months prior to the field survey in March, the area received a total of 756 mm of rainfall, which is well above average for the same time period (521.1 mm; **Table 1**; BoM 2021).

In the 12 months preceding the field survey in May, the area received a total of 1,193.6 mm, which is above the long-term average. In the three months prior to the field survey, the area received a total of 370.4 mm of rainfall, which is above average for the same time period (312.5 mm; **Table 2**; BoM 2021).

Monthly temperature data is available from the Fitzroy Crossing Aero weather station (station number 3093, located approximately 65 km east of the Project Area; data 1997-current). Maximum mean monthly temperatures in the region range from 30.6°C (June) to 41°C (November). Minimum mean monthly temperatures in the region range from 12.2°C (July) to 25.28°C (December). The temperature at the time of the March survey was hot, with a maximum temperature of 38.5°C and a minimum temperature of 22.9°C recorded (BoM 2021). The temperature at the time of the May survey was hot, with a maximum temperature of 36.8°C and a minimum temperature of 17.5°C recorded (BoM 2021).

Table 1: Rainfall data recorded at the Liveringa weather station (3100) 12 months prior to the March field survey compared to the long-term average (BoM 2021)

Month	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total monthly rainfall 2020-21 (mm)	156.6	9.8	87.4	0	0	0	0	0	72.4	266.4	397	92.6	**1,082.2**
Average monthly rainfall 2001 - current	120.5	16.3	22.7	7.2	7.7	2.7	0	7	46.2	123.1	222.3	175.7	**751.4**

1 It is noted that the broader Development Envelope has been included in relevant mapping for general context, however results discussed in the following sections pertain to the Project Area only.

Table 2: Rainfall data recorded at the Liveringa weather station (3100) 12 months prior to the May field survey compared to the long-term average (BoM 2021)

Month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Total monthly rainfall 2020-21 (mm)	87.4	0	0	0	0	0	72.4	266.4	397	92.6	277.8	0	**1,193.6**
Average monthly rainfall 2001 - current	22.7	7.2	7.7	2.7	0	7	46.2	123.1	222.3	175.7	120.5	16.3	**751.4**

2.1.2. Interim-Biogeographic Regionalisation for Australia

IBRA divides Western Australia into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation (DAWE 2020a). The Project Area is located in the Dampierland (DAL) region, which is characterised by extensive plains, ranges and spectacular gorges, with vegetation characterised by acacia thickets with scattered trees and areas of grassland and savannahs (Bastin and the ACRIS Management Committee 2008). The Dampierland bioregion is further divided into two subregions, the Fitzroy Trough subregion (DAL01) and the Pindanland subregion (DAL02).

The Project Area occurs within the Fitzroy Trough (DAL01) subregion, which is described as having four basic components (Graham 2001):

- Quaternary sandplain overlying Jurassic and Mesozoic sandstones with Pindan. There are hummock grasslands on hills.
- Quaternary marine deposits on coastal plains, with mangal, samphire – *Sporobolus* spp. grasslands, *Melaleuca alsophila* low forests, and Spinifex spp. – *Crotalaria* spp. strand communities.
- Quaternary alluvial plains associated with the Permian and Mesozoic sediments of Fitzroy Trough support tree savannahs of ribbon grass (*Chrysopogon* spp.), bluegrass (*Dichanthium* spp.) and Mitchell grass (*Astrebla* spp.) scattered coolibah (*Eucalyptus microtheca*) - *Bauhinia cunninghamii*. There are riparian forests of river red gum (*Eucalyptus camaldulensis*) and Cadjeput (*Melaleuca* spp.) fringe drainages.
- Devonian reef limestones in the north and east support sparse tree steppe over lobed spinifex (*Triodia intermedia*) and limestone spinifex (*T. wiseana*) hummock grasses.

2.1.3. Rangelands land systems mapping

Rangeland Land Systems mapping, prepared by the Department of Primary Industries and Regional Development (DPIRD; formerly Department of Agriculture and Food Western Australia [DAFWA]; DPIRD 2021a), provides and comprehensive and standardised description of landscapes, soils and vegetation of the Kimberley region of Western Australia at a regional scale (Payne and Schoknecht 2011). These surveys describe the biophysical characteristics of each region and subsequently divide each region into land systems; land systems being defined as repeating patterns of topography, soils and vegetation.

A total of three Rangelands Land Systems have been mapped across the Project Area, namely the Calwynyardah Land System, the Camelgooda Land System and the Djada Land System (Payne and Schoknecht 2011; **Table 3**; **Figure 2**).

Table 3: Rangelands Land System mapping of the Project Area

Land system	Description	Total extent (ha)	Extent (ha) within the Disturbance Footprint	Extent (ha) within the Additional Survey Area	Total extent (ha) within the Project Area	Proportion of total extent within the Project Area (%)
Calwynyardah Land System	Alluvial plains with scalded tracts downslope from lateritic remnants with yellowish loamy soils supporting patchy beefwood-bauhinia low woodlands with curly spinifex and ribbon grass; also minor hard spinifex grasslands.	173,613.7	15.49	3.27	18.75	0.011
Camelgooda Land System	Sandplains, swales and linear sand dunes supporting low pindan woodlands of acacias and low woodlands of bauhinia and bloodwood with curly spinifex and ribbon grass.	1,798,104.1	96.97	7.01	103.98	0.006
Djada Land System	Active flood-plains with levees and levee back slopes supporting ghost gum open woodlands with frontage grasses, and cracking clay back plains supporting ribbon grass-blue grass and Mitchell grass grasslands.	443.548.6	0	5.41	5.41	0.001

2.1.4. Beard's (1979) vegetation mapping

Vegetation type and extent have been mapped at a regional scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:1,000,000, DPIRD (DAFWA) has compiled a list of vegetation extent and types across WA (Shepherd *et al*. 2002).

A total of four pre-European vegetation associations have been mapped across the Project Area, each of which have more than 99% of their total pre-European extents remaining within the Fitzroy Trough (DAL01) subregion (**Table 4**; **Figure 3**; Government of Western Australia 2019).

Table 4: Beard's (1979) / Shepherd *et al.* (2002) vegetation associations of the Project Area

Vegetation association	Description	Pre-European extent (ha) within the Fitzroy Trough (DAL01) subregion	Current extent (ha) within the Fitzroy Trough (DAL01) subregion	% remaining	Extent (ha) within the Disturbance Footprint	Extent (ha) within the Additional Survey Area	Extent (ha) within the Project Area	Proportion of extent (%) within the Project Area
NORTH FITZROY PLAINS_64	Grasslands, tall bunch grass savanna low tree; baobabs (*Adansonia gregorii*), bauhinia & beefwood (*Grevillea striata* over ribbon grass)	410,085.60	409,862.82	99.95	0.00	1.07	1.07	0.0003
NORTH FITZROY PLAINS_699	Shrublands, pindan; *Acacia eripoda* shrubland with scattered low bloodwood (*Eucalyptus dicromophloia*) & *E. setosa* over soft & curly spinifex on sandplain	180,118.58	179,963.89	99.91	6.58	7.48	14.06	0.0078
NORTH FITZROY PLAINS_700	Shrublands, pindan; *Acacia eripoda* shrubland with scattered low bloodwood & *Eucalyptus setosa* over soft & curly spinifex between dunes	212,971.66	212,971.66	100.00	92.62	7.14	99.72	0.0468
NORTH FITZROY PLAINS_710	Mosaic: Grasslands, tall bunch grass savanna low tree; baobabs, bauhinia & beefwood over ribbon grass / Hummock grasslands, grass steppe, *Trioda pungens*	25,596.64	25,596.64	100.00	13.26	0.00	13.26	0.0518

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2.1.5. Hydrology

The Project Area is located in the Fitzroy River Catchment of the Fitzroy River Basin. The Fitzroy River Catchment area spans almost 94,000 km^2, covering more than 20% of the Kimberley region of Western Australia, extending from Derby in the west to Halls Creek and the Leopold Ranges in the east (Pusey and Kath 2015).

The Fitzroy River is the main major river system in the basin and is characterised by a braided channel, anabranching and billabongs on floodplain, with deep permanent pools occur along its whole length, separated by shallower reaches (Pusey and Kath 2015). Rivers, streams and wetlands of the Fitzroy River range from those that rarely flow or are inundated only occasionally (e.g. when large storm events occur) to those that flow most or all year round usually because of connections to groundwater (Pusey and Kath 2015).

One major tributary to the Fitzroy River runs through the Project Area, namely Mt. Hardman Creek (**Figure 4**). A number of rivers and creeks are located within a 30 km radius of the Project Area, including 8 Mile Creek, Fitzroy River, Mt Wynne Creek, Cherrabun Creek, Cunninghame river and Kalyeeda creek (**Figure 4**). Several additional smaller waterbodies (billabongs, waterholes, swamps and dams) are located within 30 km of the Project Area.

2.1.6. Areas of significance

Environmentally Sensitive Areas (ESAs) are defined in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005 under s. 51B of the EP Act. ESAs include areas declared as World Heritage, included on the Register of the National Estate, defined wetlands, and vegetation containing rare (Threatened) flora and Threatened Ecological Communities (TECs).

No ESAs are known to occur within the Project Area. One ESA, namely the Camballin Floodplain, listed on the Register of National Estate, is located approximately 27.2 km to the west of the Project Area (**Figure 5**). The Camballin Floodplain is listed in the Directory of Important Wetlands of Australia (DIWA WA017) and has been nominated for listing as a wetland of international significance under the Ramsar Convention (Place ID 18366; Department of Environment and Conservation [DEC] 2009). Its significance is due to the paucity of floodplains in the Kimberley region, usage of the site by migratory waterbirds and because it contains many sites of significance to the local Aboriginal people. Le Lievre Swamp (Iljamalkarda in the local dialect) is crucial to the hydrology of the floodplain and interacts with the regional groundwater system (DEC 2009).

The Project Area is not located within any Commonwealth or State listed Conservation reserves or Department of Biodiversity, Conservation and Attractions (DBCA) managed lands. A total of two nature reserves occur within 50 km of the Project Area, namely Tunnel Creek National Park and Devonian Reef Conservation Park, located 49.3 km and 42.8 km northwest of the Project Area, respectively (**Figure 5**).

Figure 2: Rangelands Land System mapping of the Project Area (Payne and Schoknecht 2011)

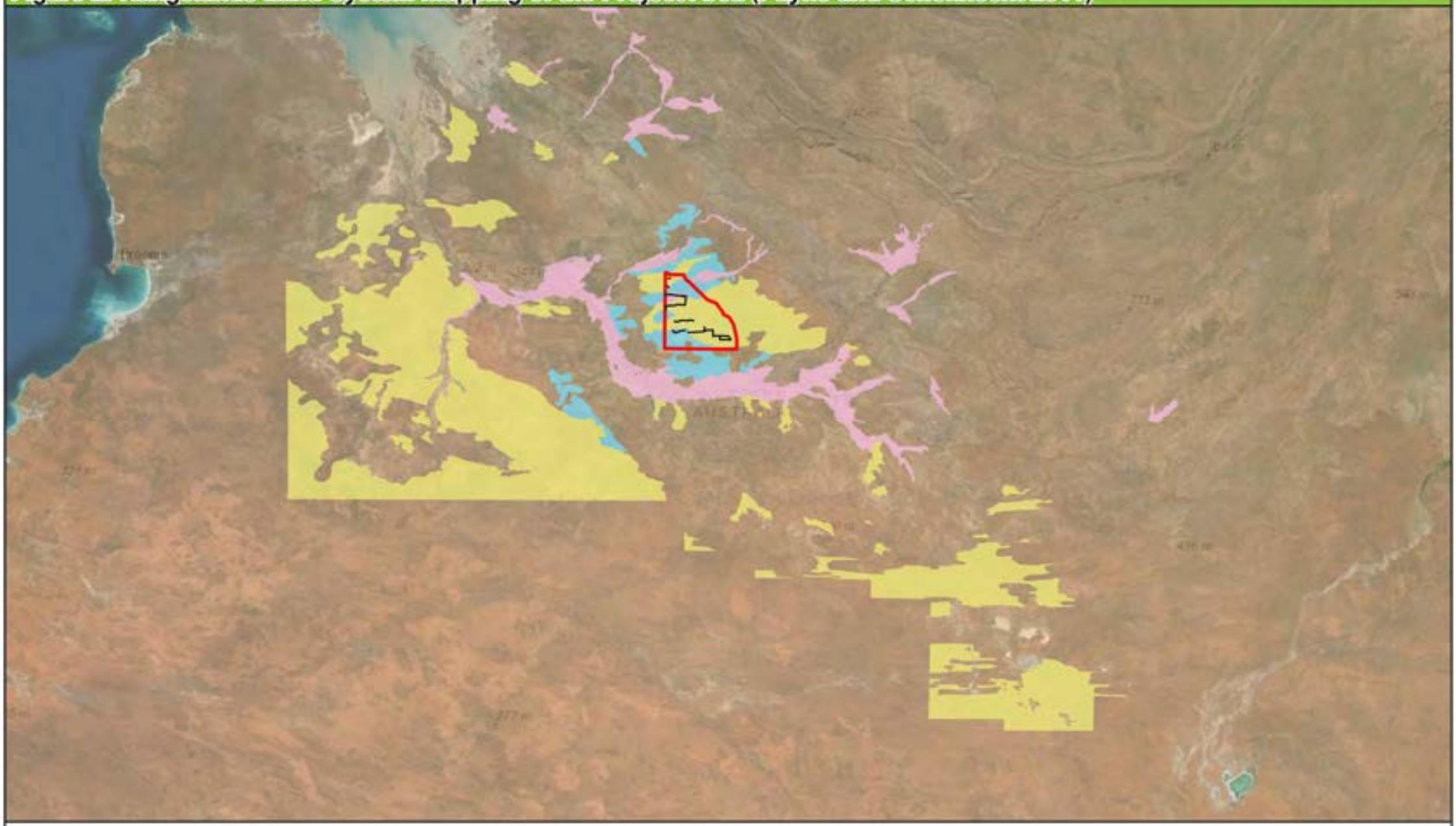
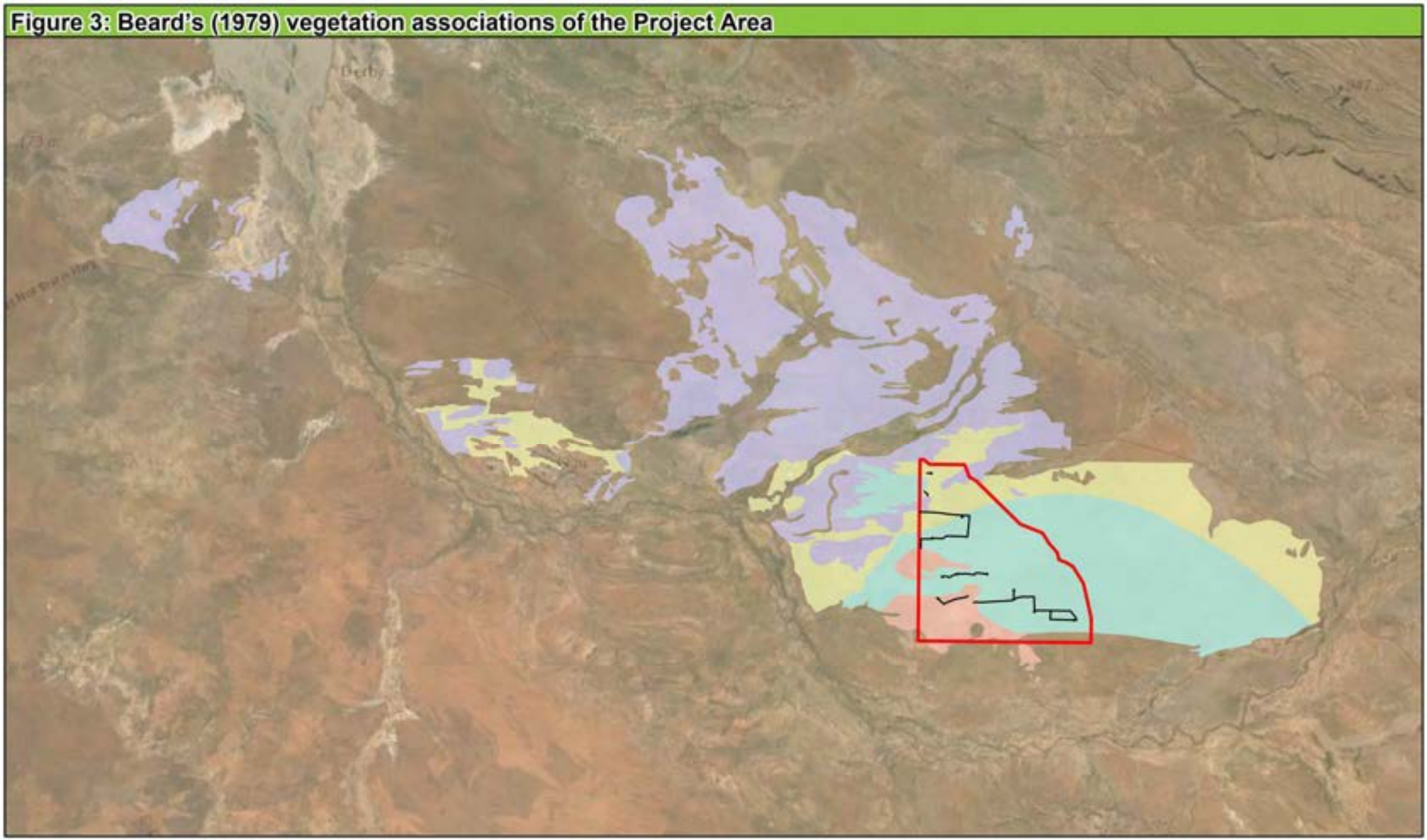


Figure 3: Beard's (1979) vegetation associations of the Project Area



Legend

- Development Envelope
- Project Area

Beard's (1979) vegetation association

- North Fitzroy Plains 64
- North Fitzroy Plains 699
- North Fitzroy Plains 700
- North Fitzroy Plains 710

0 5 10 20
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 51

N

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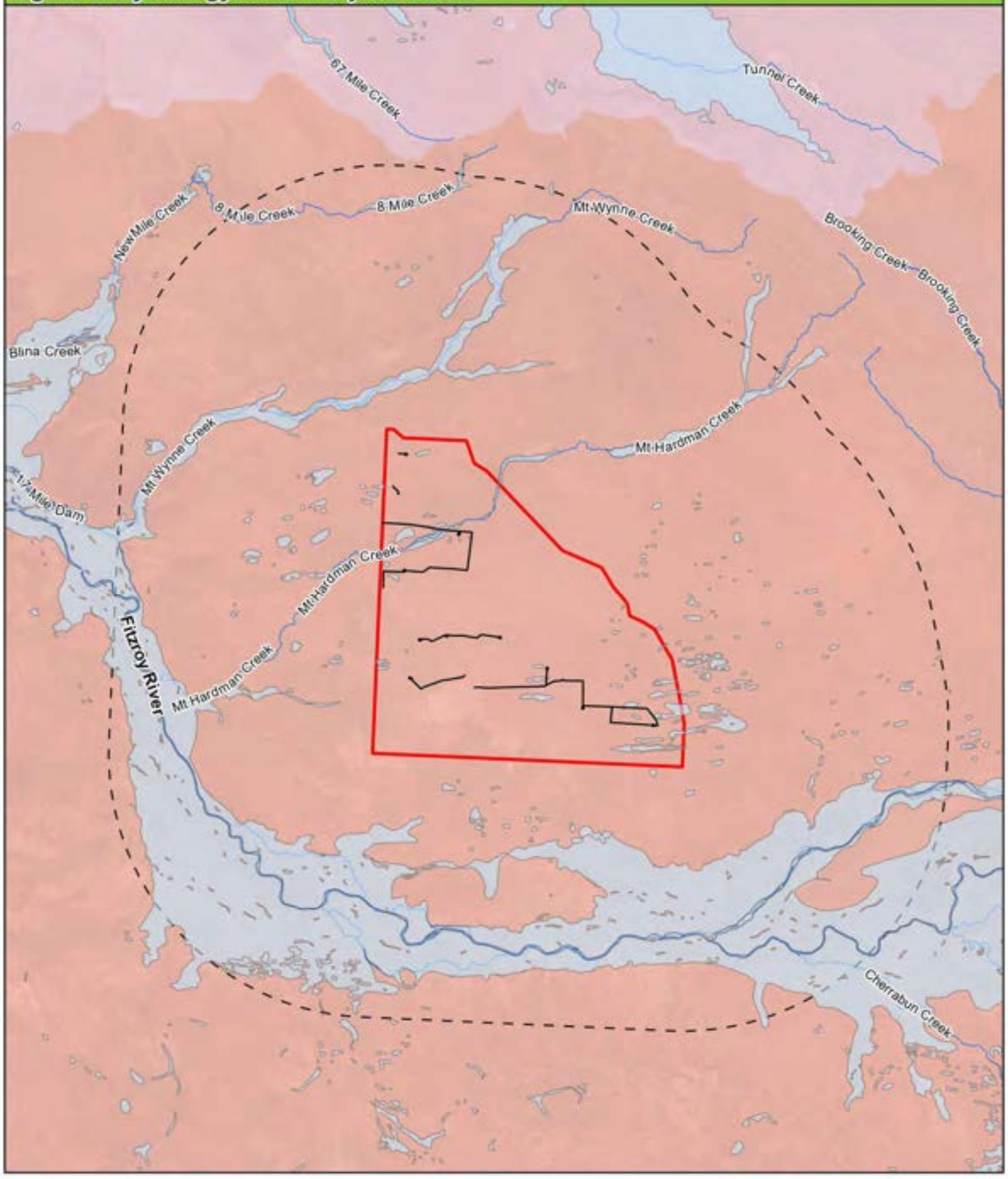
Figure 4: Hydrology of the Project Area



Legend

- Development Envelope
- Project Area
- Development Envelope 30km Buffer
- Waterbodies (Statewide)
- Major River
- Minor Tributary

Catchment Name

- Fitzroy River
- Lennard River

0 4.75 9.5 19
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 50

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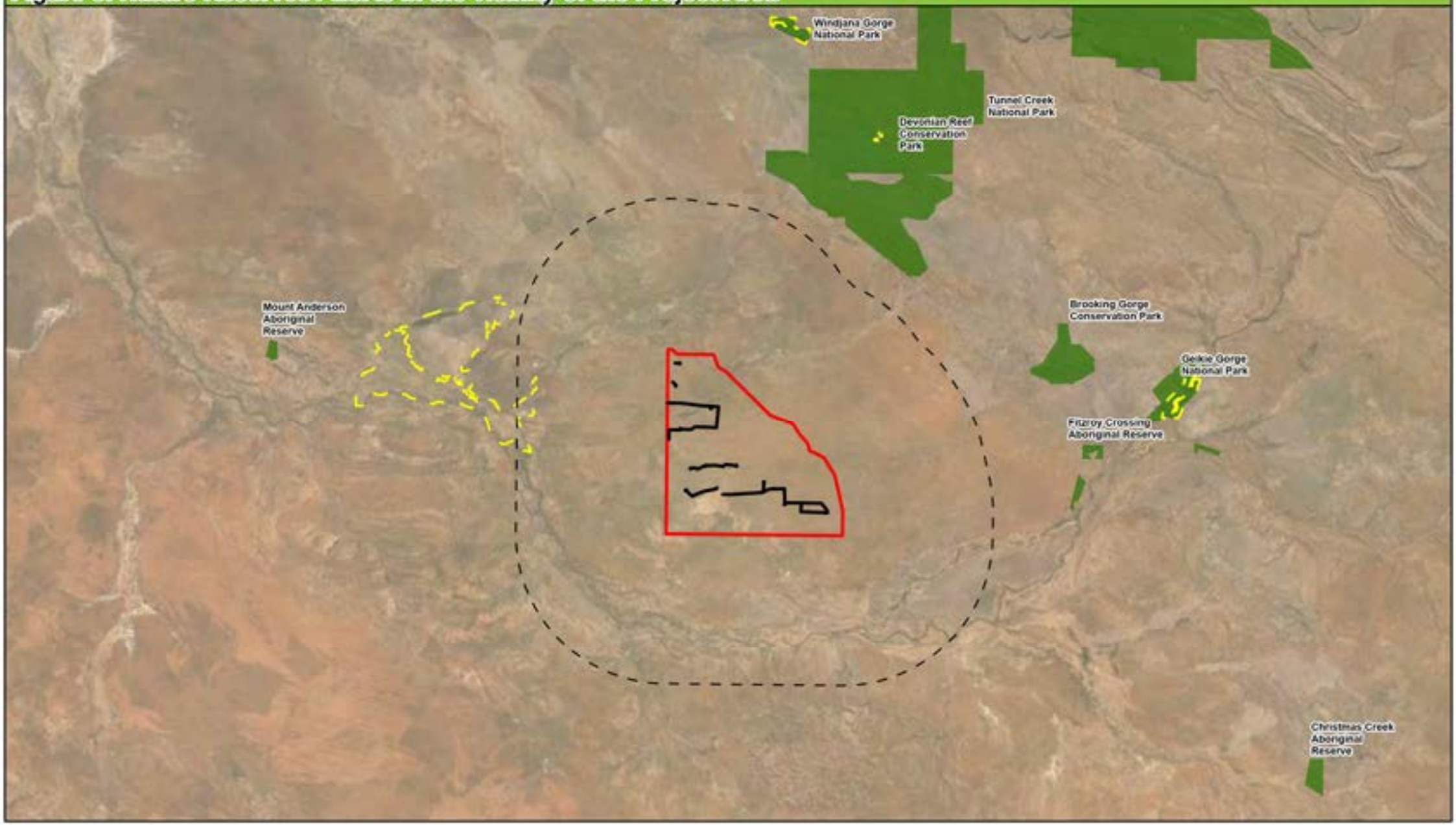
Figure 5: Nature Reserves / ESAs in the vicinity of the Project Area



Legend

- Development Envelope
- Development Envelope 30km Buffer
- Project Area
- Nature Reserves
- Environmentally Sensitive Area (ESA)

0 5 10 20
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 51

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3. Methodology

3.1. Desktop review

3.1.1. Database searches and literature review

The following Commonwealth and State databases were searched for information relation to conservation listed flora, fauna and ecological communities in order to compile and summarise existing data to inform the field survey. Database searches undertaken around the central coordinates 706862 metres (m) E; 7981169m N are provided in **Table 5** below. Applied buffers below are considered suitable based on flora and fauna assemblages expected to occur within the Project Area.

Table 5: Database searches undertaken for the Project Area

Database	Reference	Buffer (km)
Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST) for Threatened species and communities listed under the EPBC Act.	DAWE 2021b	30
DBCA and Western Australian Herbarium (WAH) NatureMap online database.	DBCA 2007-2021	30
DBCA Threatened and Priority flora database searches for Declared Rare Flora (DRF) listed under the latest WA Wildlife Conservation (Rare Flora) Notice and Priority Flora.	DBCA 2021a	100
DBCA Threatened and Priority fauna database searches for Scheduled fauna listed under the EPBC Act or latest WA Wildlife Conservation (Specially Protected Fauna) Notice and Priority Fauna.	DBCA 2021b	80
DBCA Threatened and Priority Ecological Communities' database search	DBCA 2021c	50

In addition, the following documents pertaining to the Project Area were reviewed for conservation significant flora and fauna species and ecological communities:

- *Ophir, Paradise, Valhalla, Eden and Ellendale Flora, Vegetation and Fauna Survey Report* (Buru Energy and Outback Ecology 2014);
- *Level 1 Vegetation, Flora and Fauna Survey of Kurrajong, Yakka Munga and Valhalla Central Well Sites* (ELA 2016);
- *Valhalla Central 4 Flora and Fauna Survey* (ELA 2018);
- *Flora and Vegetation Survey: Valhalla North* (Low Ecological Services 2011a)
- *Valhalla East-1 Exploration Well: Flora and Fauna Survey* (Low Ecological Services 2011b);
- *Asgard-1 Exploration Well: Flora, Vegetation and Fauna Survey* (Low Ecological Services 2012a);
- *Asgard 2D Seismic Survey: Flora, Vegetation and Fauna Survey* (Low Ecological Services 2012b);
- *Flora and Fauna Assessment – Odin 2D and 3D seismic survey, Fitzroy Basin, Western Australia* (Low Ecological Services 2020);
- *Targeted bilby survey of proposed well site 'Valhalla Central', and immediate area* (Murdoch University 2016); and
- *Valhalla – 01 Well Site Flora and Vegetation Survey* (Woodman Environmental Consulting 2007).

3.1.2. Likelihood of occurrence assessment

A pre-survey likelihood of occurrence assessment was undertaken to identify conservation listed flora and fauna species that possibly occur within the Project Area, identified from a review of key datasets and literature, as specified above. Following the field survey, the pre-survey likelihood of occurrence assessment was reassessed based on results of the field survey (availability of suitable habitat). Aquatic and marine species were not considered in the likelihood of occurrence assessment as the Project Area does not contain core habitat that these species solely rely on for survival. Conservation codes, categories and criteria for flora and fauna protected under the EPBC Act and the State *Biodiversity Conservation Act 2016* (BC Act) are provided in **Appendix A**. Criteria used for this assessment is presented in **Appendix B**.

3.2. Field survey

3.2.1. Survey team and timing

A Detailed and Targeted flora and vegetation survey and a Basic fauna survey were conducted by Jeff Cargill (Senior Botanist), Emily Chetwin (Botanist), Jeni Morris (Ecologist) and Briana Wingfield (Ecologist) from 3 to 10 March 2021. An additional supplementary survey was undertaken by Emily Chetwin and Jeni Morris from 25-27 May 2021. The survey team's relevant qualifications, experience and licences are provided in **Table 6** below. There was 2.4 mm of rainfall recorded during the field survey in March (BoM 2021). No rainfall was recorded during the May field survey (BoM 2021).

Table 6: Survey team

Name	Qualification	Relevant experience	Licences
Dr. Jeffry Cargill	BSc. Hons. PhD Environmental Sciences	Jeff has more than 12 years' experience in botanical and ecological studies throughout Western Australia including baseline vegetation studies (Reconnaissance and Detailed surveys), Targeted Threatened and Priority flora surveys, fauna and black cockatoo surveys, MNES surveys, environmental risk assessments and rehabilitation and vegetation monitoring programs.	Flora scientific collection licence: FB62000138 Declared Rare Flora (DRF) permit: TFL 48-1920
Emily Chetwin	BSc Geology. Masters. Hons.	Emily is a botanist with over three years' experience undertaking flora and vegetation across multiple bioregions of Western Australia. She has conducted Detailed and Reconnaissance baseline flora and vegetation surveys, targeted Threatened species surveys, rehabilitation and vegetation monitoring and assessment, habitat assessments and bushland condition assessments.	Flora scientific collection licence: FB62000026-3 Declared Rare Flora (DRF) permit: TFL 124-2021
Jeni Morris	BSc Conservation and Wildlife Biology	Jeni has over six years' undertaking ecological survey and monitoring in Western Australia. She is competent in undertaking Baseline flora and fauna surveys and Targeted species surveys and has experience leading field teams in remote areas. Jeni has been undertaking flora and fauna surveys for mining and infrastructure in the Kimberley region since 2016.	Flora scientific collection licence: FB62000070 Declared Rare Flora (DRF) permit: TFL 13-1920
Briana Wingfield	BSc. Conservation and Wildlife Biology and Environmental Science (Hons)	Briana has seven years' experience conducting fauna surveys across multiple bioregions within Western Australia, including Detailed, Targeted and Basic fauna surveys and black cockatoo habitat assessments.	Flora scientific collection licence: FB62000316

3.2.2. Flora and vegetation survey

A Detailed and Targeted flora and vegetation survey was conducted in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). A total of 64 quadrats were established within the Project Area (**Figure 6**). Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. The survey involved the use of 50 x 50 m quadrats as recommended for the Dampierland bioregion (EPA

2016). Opportunistic sampling of species not recorded within the quadrats was undertaken where appropriate to supplement the existing list of species recorded from within the Project Area.

Photographs were taken from the northwest corner of each quadrat facing south-east. Within each quadrat, the following data was recorded:

- Site details (site name, site number, observers, date and location);
- Environmental information including landform, soil type and colour, bare ground and leaf litter cover, rock outcropping and time since last fire event; and
- Biological information including vegetation structure, vegetation condition in accordance with Keighery (1994), degree of disturbance, species present and species percentage cover.

A Targeted survey was completed within the Project Area to identify the following:

- TECs listed under the EPBC Act;
- Threatened (Declared Rare) Flora listed under the latest WA Wildlife Conservation (Rare Flora) Notice under the BC Act;
- Priority Ecological Communities (PECs) endorsed by the Western Australian Minister for the Environment;
- Priority (P) flora recognised by DBCA;
- Location of any culturally significant / Aboriginal significant bush foods; and
- Identification of the presence and extent of introduced flora (weed) species.

Where possible, field personnel walked meandering transects across suitable habitat within the Project Area to search for conservation significant flora species, with transects spaced apart depending on factors such as habitat type, disturbance (e.g. tracks) and landform. Due to access restrictions, not all of the Project Area was able to be traversed on foot. Survey limitations are discussed further in Section 3.2.6 below. Locations of survey transects are shown in **Figure 6** below. Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For conservation significant flora species identified in the field, the following was recorded:

- A colour photograph;
- GPS location;
- Population size estimate;
- Location of population boundaries;
- Associated habitat/landscape element;
- Time and date observed;
- Observer details; and
- A voucher specimen suitable for use as a reference specimen (if appropriate to do so for conservation significant flora).

When conservation significant species were encountered the coordinates of individuals, and/or centroid of populations greater than 100, was recorded within a 20 m radial circumference. If a population extended outside of the Project Area individual were counted. Other information recorded includes the number of individuals and percentage of cover.

Specimen identification was undertaken by ELA Taxonomist Daniel Brassington. Species identification utilised taxonomic literature and keys and where required specimens were confirmed using the WAH reference collection. Suitable material that meets WAH specimen lodgement requirements, such as flowering material and range extensions, will be submitted along with Threatened and Priority Report forms to DBCA, as required by conditions of collection licences issued under the BC Act.

3.2.3. Data analysis

3.2.3.1. Flora species accumulation curve

A flora species accumulation curve was undertaken to indicate adequacy of the survey effort. As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness. When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered adequate.

3.2.3.2. Vegetation communities

Plymouth Routines in Multivariate Ecological Research v6 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke and Gorley 2006). A 4^{th} root transformation was applied to the percentage cover dataset to down weight the relative contributions of quantitatively dominant species. Specimens not identified to species level and singletons (species recorded at a single quadrat and not forming a dominant structural component) were excluded from the data set prior to analysis. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Hierarchical Clustering (CLUSTER), Similarity Profile Analysis (SIMPROF) and Similarity Percentages (SIMPER). Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

3.2.4. Fauna survey

The Basic fauna survey was conducted in accordance with the EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020). Broad habitat types within the Project Area were identified and described, and included the following information (where applicable):

- A colour photograph of representative habitat;
- Location of habitat type (GPS location where practical);
- Associated vegetation;
- Associated fauna species observed;
- Likely fauna of conservation significance to be hosted (based on immediate impressions);
- Habitat description, such as:
    - Hollow bearing trees and stag trees (average size and abundance);
    - Rocky outcrops (average rock size and extent);
    - Course woody debris, i.e. logs and fallen timber (abundance and size);
    - Substrate (description of composition, presence of algal crust and % cover of leaf litter);

  - Presence of wetland habitats and watercourses, including drainage lines, billabongs, active floodplains, dams, etc.; and
  - Any nests, roosts or other evidence of breeding habitat present; and
- Habitat condition and evidence of disturbance.

Fauna species were recorded opportunistically within the Project Area, and where possible meandering transects were conducted across suitable habitat to survey for conservation significant fauna and habitat supporting these species. Due to access restrictions, not all of the Project Area was able to be traversed on foot. Survey limitations are discussed further in Section 3.2.6 below. Locations of survey transects are shown in **Figure 6** below. Evidence recorded during searches included both direct evidence (vertebrate fauna seen or heard) and indirect (scats, tracks, dead specimens or burrows etc.). Opportunistic observations were also made between survey sites, including opportunistic observations of invertebrate species.

Habitats specifically supporting conservation significant fauna species likely to occur in the Project Area were targeted during the field survey and, where this habitat was identified, an estimate of extent and location boundaries was recorded. For any conservation significant fauna identified in the field, the following information was recorded:

- GPS locations;
- Estimated number of individuals observed, or estimated age of evidence observed;
- Associated habitat/landscape element;
- Time and date observed; and
- Observer details.

Identification of fauna species was undertaken by Jeni Morris and Briana Wingfield in the field. If any species were unable to be identified, photographs were taken when possible and were identified at a later date.

3.2.5. Nomenclature

Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and WAH 2021).

Nomenclature used for the vertebrate fauna species within this report follows the Western Australian Museum (WAM) Checklist of the Vertebrates of Western Australia, as available on the WAM website (WAM 2021). Where common names were not stated for certain species, the following references were consulted:

- Amphibians: Tyler and Doughty (2009);
- Reptiles: Wilson and Swan (2013);
- Birds: Morcombe (2003); and
- Mammals: Menkhorst and Knight (2011).

3.2.6. Limitations

The EPA *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) recommends including discussion of the constraints and limitations of the survey methods used.

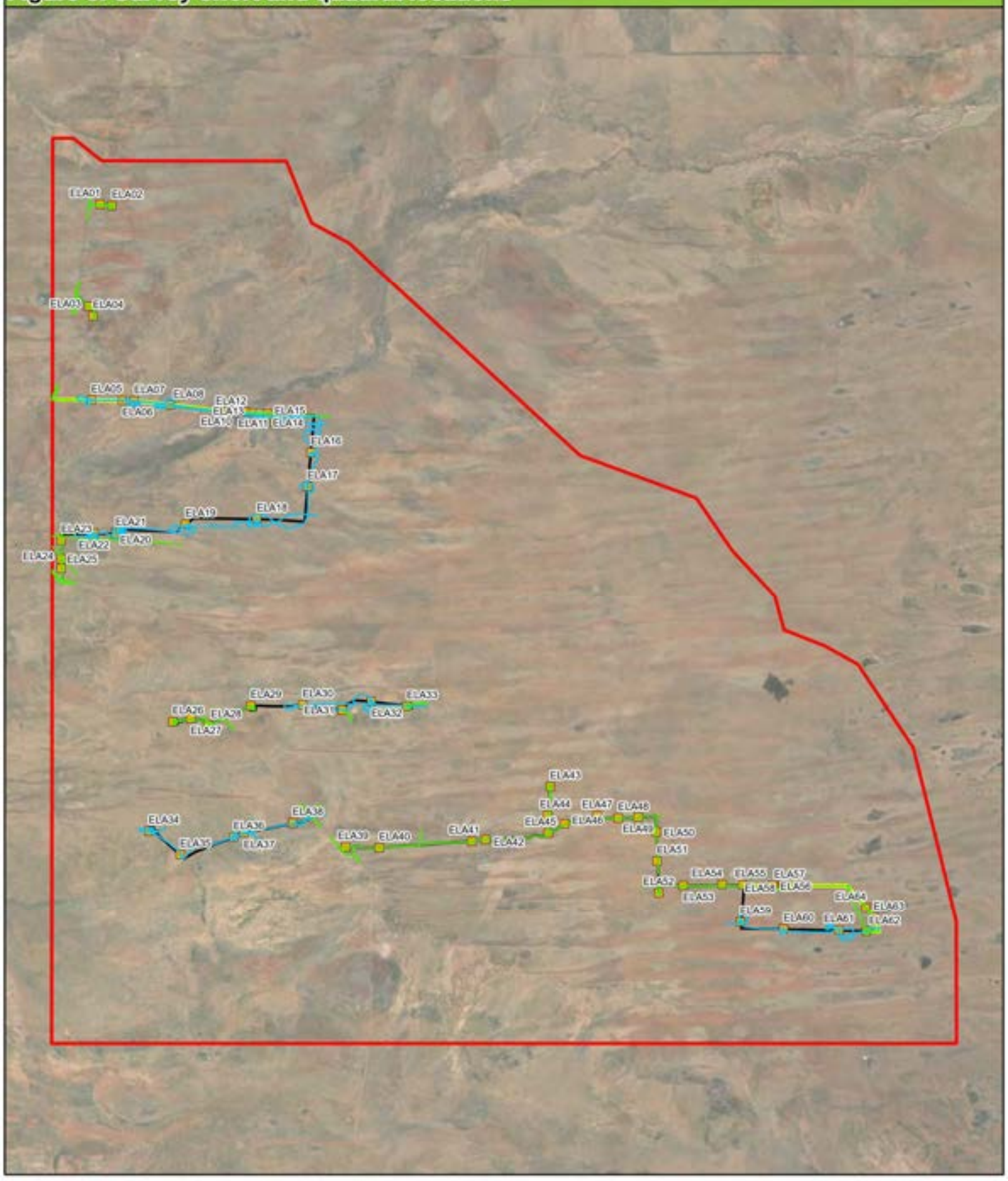
Constraints and limitations for the Reconnaissance flora and vegetation survey and the Basic fauna survey are summarised in **Table 7** below. Three potential constraints were identified.

Table 7: Survey limitations

Constraint	Limitations
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	**Not a constraint**: Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. A number of relevant background reports, undertaken in the vicinity of the Project Area, were available. Available information was sufficient for the purposes of the work being undertaken and as such sources of information were not considered a major limitation.
Scope (i.e. what life forms, etc., were sampled).	**Potential constraint**: The survey requirement of a Targeted level flora survey was unable to be adequately met within all sections of the Project Area due to access restrictions, namely inaccessible (non-existent, overgrown or inundated) tracks. Foot traverses were undertaken where possible (and safe) to do so. Based on the desktop assessment (database searches and literature review) and a detailed post-survey flora likelihood of occurrence assessment based on detailed vegetation mapping and site characteristics, no Threatened flora species are considered as being likely or having the potential to occur within the Project Area. The survey requirement of a Targeted level fauna survey was unable to be adequately met within all sections of the Project Area due to access restrictions (above). Foot traverses were undertaken within appropriate habitat where possible (and safe) to do so. Of note, not all areas considered as potentially suitable to sustain populations of the Greater Bilby (*Macrotis lagotis*) were able to be traversed on foot. Secondary signs of this species were recorded within Fauna habitat 2 and, as such, this species is considered as being likely to occur throughout this habitat, which was mapped across an extent of 38.12 ha (29.75%) of the Project Area. In addition, a total of seven Threatened bird species are also considered as having the potential to occur within the Project Area. Due to the vagrant and mobile nature of these species, their likelihoods of occurrence are based on availability of potentially suitable habitat within the Project Area. The survey requirement of a Detailed level flora and vegetation survey and a Basic fauna survey within the Project Area was adequately met.
Intensity of survey	**Potential constraint:** The number of quadrats established was sufficient to determine the vegetation communities present within the Project Area (with a minimum of three quadrats established per vegetation community) and also identify possible vegetation communities of significance. Targeted survey for conservation significant flora and fauna species was unable to be completed within all sections of the Project Area due to access restrictions, however foot traverses were undertaken within appropriate habitat where possible (and safe) to do so. A conservative approach was undertaken to conservation listed flora and fauna species likelihood of occurrences within the Project Area, and this was informed through the desktop assessment process, on-ground vegetation/habitat mapping and opportunistic observations in the field.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Not a constraint**. Proportion of flora species collected was adequate to meet the requirements of the level of survey undertaken (Detailed level flora and vegetation survey), with approximately 91.7% of the flora species potentially present within the Project Area recorded. This high percentage reflects the common occurrence of key species across the landscape, which co-occur at varying levels of structural and compositional dominance; this point is reflected in vegetation community descriptions whereby subtle variations in the dominance of common species largely define the communities.
Mapping reliability.	**Not a constraint**. Delineation and mapping of vegetation communities was adequate based on requirements of a Detailed level vegetation survey. High quality aerial imagery was used for both the field survey and subsequent vegetation mapping. It is noted that fire scars are

Constraint	Limitations
	present across much of the Project Area, however this did not limit the ability to accurately delineate vegetation communities present. Mapping was undertaken based on results of statistical analysis on data and through interpretation of aerial photography and field notes.
Timing, weather, season, cycle	**Not a constraint:** The Project Area is located in the Northern botanical province of Western Australia. Recommended survey timing for this region includes the wet season (January – March) and post-wet season for flora (EPA 2016) and in the season following maximum rainfall for fauna (EPA 2020). The initial field survey was undertaken in season from 3-10 March 2021. A supplementary field survey, undertaken following amendments to the original Project Area boundary, was completed from 25-27 May 2021. Rainfall in the three months preceding both survey periods was above average (March; 756 mm compared to an average of 521.1 mm; May; 370.4 mm compared to an average of 312.5 mm; BoM 2021). As such, both field survey periods were considered suitable for identification of annual and cryptic perennial flora species.
Disturbances	**Not a constraint:** The Project Area traverses a large area and incorporates several disturbances, including pastoral activities (e.g. cattle grazing, tracks and congregating around water points), weeds, clearing/tracks and edge effects from main tracks. Large sections of the Project Area had been previously cleared for pastoral access (tracks) and were found to be in various stages of regrowth. The Project Area also had prevalence of fire with many areas being recently burnt, particularly preceding the field survey in May. These disturbances did not hinder the ability to determine vegetation communities within the Project Area, with the average number of species in quadrats established during the May field survey comparable to the average number established during the May field survey (25 species compared to 28 species, respectively).
Resources	**Not a constraint:** The personnel conducting this field survey were both suitably qualified to identify flora and fauna specimens in the Northern botanical province, having previously undertaken work in this region.
Accessibility	**Potential constraint:** Sections of the Project Area were unable to be accessed during the March field survey due to overgrown and inaccessible vehicle tracks. These areas were re-visited during the May field survey by helicopter in order to establish quadrats for vegetation community and condition mapping, however, were unable to be traversed on foot to undertake targeted searches due to large distances, posing a safety risk for field staff.
Experience levels (e.g. degree of expertise in plant identification to taxon level).	**Not a constraint**. The personnel conducting this field survey were both suitably qualified to identify specimens, having previously undertaken flora and fauna surveys within the Dampierland bioregion of Western Australia.

Figure 6: Survey effort and quadrat locations



Legend

- Development Envelope
- **Project Area**
- Proposed access track / camp locations
- Additional Survey Area
- Quadrat 50x50m
- Vehicle Survey Track
- Helicopter Survey Track

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Datum/Projection:
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Prepared by: DD-17692 Date: 22/07/2021

4. Results

4.1. Desktop review

4.1.1. Previous studies

Consolidated findings of assessments undertaken within, or in the vicinity of the Project Area, as outlined in Section 3.1.1 is presented in **Table 8** below.

Table 8: Consolidated findings of literature review

Author	Report	Distance to Project Area	Significant flora	Significant ecological communities	Significant fauna	Declared Pests / WoNS
Low Ecological Services (2020)	Flora and Fauna Assessment – Odin 2D and 3D seismic survey, Fitzroy Basin, Western Australia	Similar if not overlapping.	Nil	Nil	Unconfirmed signs of the Northern Quoll (*Dasyurus hallucatus*) and Greater Bilby (*Macrotis lagotis*) were observed.	**Calotropis procera*
ELA (2018)	Valhalla Central 4 Flora and Fauna Survey	Within Development Envelope along creekline track.	Nil	Nil	Nil	Nil
ELA (2016)	Level 1 Vegetation, Flora and Fauna Survey of Kurrajong, Yakka Munga and Valhalla Central Well Sites	Valhalla Central A is the only site relevant, located within Development Envelope near marsh-reroute.	*Pterocaulon intermedium* (no longer listed)	Nil at Valhalla Central A	Rainbow Bee-eater (*Merops ornatus*); listed as Marine only	Nil
Murdoch University (2016)	Targeted bilby survey of proposed well site 'Valhalla Central', and immediate area	Within Development Envelope, central.	Nil	Nil	Nil	Nil
Buru Energy and Outback Ecology (2014)	Ophir, Paradise, Valhalla, Eden and Ellendale Flora, Vegetation and Fauna Survey Report	Adjacent to the west.	Nil	Nil	*Ardea modesta* (not currently listed), *Ardeotis australis* (not currently listed), *Burhinus grallarius* (not currently listed), *Merops ornatus* (listed as Marine only), *Tringa nebularia* (IA), *Tringa stagnatilis* (IA)	Nil
Low Ecological Services (2012a)	Asgard-1 Exploration Well: Flora, Vegetation and Fauna Survey	33 km north-northwest of Development Envelope.	Nil	Nil	Nil	Nil

Author	Report	Distance to Project Area	Significant flora	Significant ecological communities	Significant fauna	Declared Pests / WoNS
Low Ecological Services (2012b)	Asgard 2D Seismic Survey: Flora, Vegetation and Fauna Survey	Similar if not overlapping.	*Trianthema kimberleyi* (P1), *Goodenia virgata* (P2)	Nil	Australian Bustard (*Ardeotis australis;* not currently listed) and Rainbow Bee-eater (*Merops ornatus;* not currently listed). Unconfirmed Greater Bilby burrow.	Nil
Low Ecological Services (2011a)	Flora and Vegetation Survey: Valhalla North	73 km north northwest of Development Envelope.	Nil	Nil	Rainbow Bee-eater (*Merops ornatus*; not currently listed)	**Calotropis procera*)
Low Ecological Services (2011b)	Valhalla East-1 Exploration Well: Flora and Fauna Survey	Within Development Envelope centre north about 5 km south from northern extent.	Nil	Nil	Australian Bustard (*Ardeotis australis;* not currently listed)	Nil
Woodman Environmental Consulting (2007)	Valhalla – 01 Well Site Flora and Vegetation Survey	Within Development Envelope to northwest.	*Goodenia byrnesii* (P1), *Triodia acutispicula* (P3), *Goodenia sepalosa* var. *glandulosa* (P3)	Nil	Nil	Nil

4.1.2. Pre-survey likelihood of occurrence of conservation significant flora, fauna and ecological communities

A pre-survey likelihood of occurrence assessment was undertaken to identify conservation listed flora and fauna species that possibly occur within the Project Area, identified from a review of key datasets and literature, as described in Section 3.1.1 above. A DBCA Threatened and Priority flora, fauna and ecological communities search (DBCA 2021a, 2021b, 2021c), PMST search (DAWE 2020b) and NatureMap search (DBCA 2007-2020) were conducted to identify conservation significant species and communities recorded within, or nearby to, the Project Area (current and historic). A review of previous reports relevant to the Project Area, as outlined in Section 3.1.1, was also completed.

Based on the pre-survey likelihood of occurrence assessment, an initial 35 conservation listed flora species, 54 conservation listed fauna species and three PECs were identified as possibly occurring within the Project Area.

Conservation significant flora species identified from the pre-survey likelihood of occurrence assessment include 16 species listed as P1 by DBCA, four species listed as P2 by DBCA and 15 species listed as P3 by DBCA. Of these, one species (*Goodenia byrnesii*; P3) was considered as being likely to occur within the Project Area, while a further nine flora species were considered as having the potential to occur within the Project Area, based on the presence of nearby recent records and availability of potentially suitable habitat. The remaining 25 flora species were considered as either unlikely (24 species) or not occurring (one species). The flora likelihood of occurrence assessment is presented in **Appendix C**.

Conservation significant fauna species identified from the pre-survey likelihood of occurrence assessment include 32 species listed as Threatened under the EPBC Act and BC Act, two species listed as Threatened under the EPBC Act and as Priority by DBCA, three species listed as Threatened under the BC Act, two species listed as specially protected under the BC Act and 15 species listed as Priority by DBCA. Of these, one species (*Macrotis lagotis*; Greater Bilby; listed as Vulnerable [VU] under the EPBC Act and BC Act) was considered as being likely to occur within the Project Area, while a further 29 fauna species were considered as having the potential to occur within the Project Area, based on the presence of nearby recent records and availability of potentially suitable habitat. The remaining 24 fauna species were considered as unlikely to occur. The fauna likelihood of occurrence assessment is presented in **Appendix D**.

A total of three conservation significant ecological communities were identified from the desktop assessment, all of which were considered as having the potential to occur pre-survey:

- Kimberley Vegetation Association 760, described as 'shrublands, pindan; Acacia tumida shrubland with scattered low bloodwood & *Eucalyptus setosa* (excluded name) over ribbon & curly spinifex' (Priority 1, located approximately 20 km to the east of the Project Area; DBCA 2021c);
- Kimberley Vegetation Association 759, described as 'grasslands, tall bunch grass savanna woodland, coolabah over ribbon/blue grass (*Bothriochloa* spp.)' (Priority 3; located approximately 27 km to the west of the Project Area; DBCA 2021c); and

- Leopold Land System, described as ‘cracking clay plains and marginal outcrop alluvial plains, grasslands and very open grassy woodlands’ (Priority 3; located approximately 46 km to the east of the Project Area; DBCA 2021c).

Conservation significant flora and ecological communities and fauna species previously recorded within, and in proximity to the Project Area from DBCA database searches are presented in **Figure 7** and **Figure 8** respectively.

Figure 7: Conservation significant flora species and ecological communities previously recorded in the vicinity of the Project Area (DBCA 2021a, 2021c)

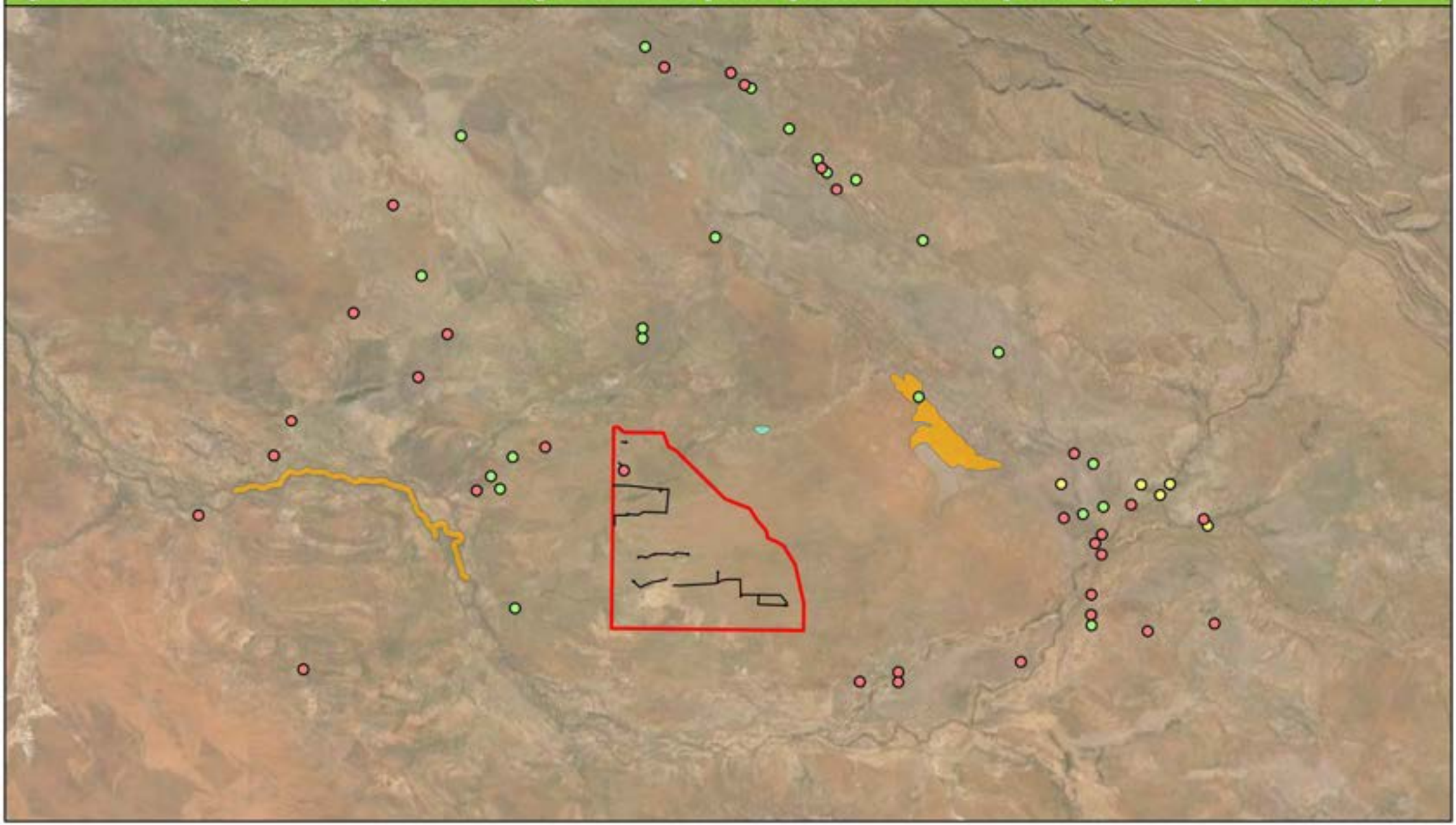
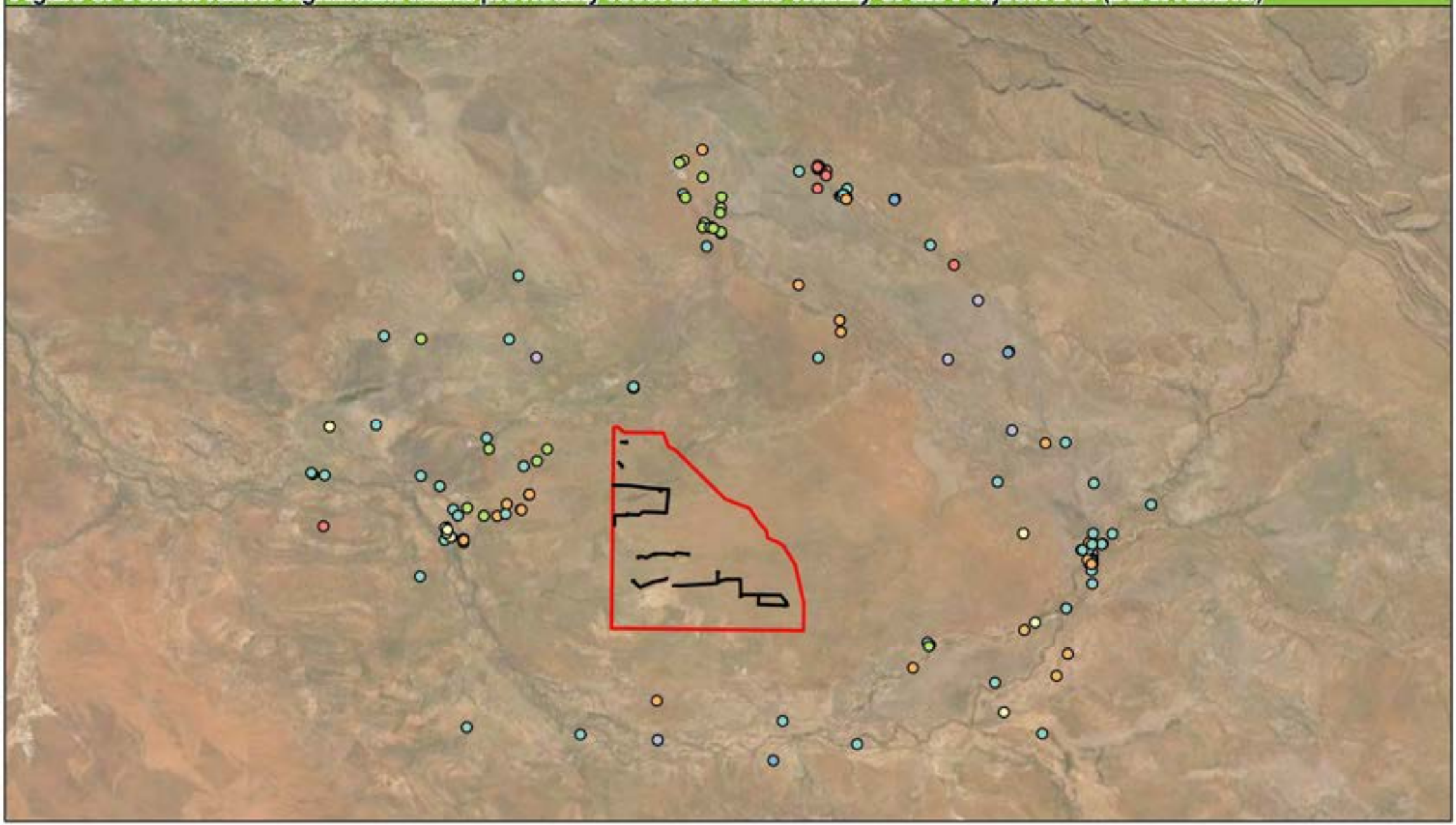


Figure 8: Conservation significant fauna previously recorded in the vicinity of the Project Area (DBCA 2021b)



Legend

- Development Envelope
- Project Area

Conservation significant fauna (DBCA 2021b)

- Threatened (EPBC Act and BC Act)
- Threatened (EPBC Act) and Priority 3 by DBCA
- Threatened (EPBC Act) and Priority 4 by DBCA
- Threatened (BC Act)
- Specially Protected (BC Act)
- Priority 1 by DBCA
- Priority 2 by DBCA
- Priority 4 by DBCA

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Prepared by: DD-17692 Date: 7/07/2021

4.2. Flora and vegetation survey

4.2.1. Flora overview

A total of 235 flora species representing 54 families and 130 genera were recorded from the 64 quadrats established within the Project Area. Average species richness per quadrat was 27 species, ranging from a low of 7 species in ELA57 to a high of 53 species in ELA39. Families with the highest number of species included Fabaceae (42 species), Poaceae (40 species) and Malvaceae (18 species). *Acacia* was the best represented genus throughout the Project Area with seven taxa recorded. A full species by site matrix is provided in **Appendix E**. Quadrat site data is presented in **Appendix F**. Floristic quadrat data and site photos are presented in **Appendix G** and **Appendix H**.

4.2.2. Accumulated species- sites surveyed (species-area curve)

A species accumulation curve was used to evaluate the adequacy of sampling. Only species data recorded from defined quadrats were used; no opportunistic flora collections were included. The asymptotic value was determined using Michaelis Menten modelling. Using this analysis, the incidence-based coverage estimator of species richness was calculated to be 256.31. Based on this value, and the total of 235 species recorded within the 64 quadrats, approximately 91.7% of the flora species potentially present within the Project Area were recorded. This high percentage indicates that a suitable proportion of flora potentially present within the Project Area were recorded, reflecting the common occurrence of key species across the landscape, which co-occur at varying levels of structural and compositional dominance. This point is further reflected in vegetation community descriptions whereby subtle variations in the dominance of common species largely define the communities.

4.2.3. Conservation significant flora

One conservation significant flora species, *Nymphoides beaglensis*, listed by DBCA as P3 was identified during the field survey as occurring within the Project Area, namely within the Additional Survey Area (**Figure 9**). This species was recorded from eight point-locations totalling 112 individuals. Individuals were found occurring within inundated areas and were flowering at the time of the field survey (**Plate 1**).

Plate 1: *Nymphoides beaglensis* (P3) recorded within the Project Area © Eco Logical 2021

Of the 35 conservation significant flora species identified from the pre-survey likelihood of occurrence assessment as possibly occurring within the Project Area, *Nymphoides beaglensis* was the only species recorded. Based on the post-survey likelihood of occurrence assessment, two of the remaining 34 flora conservation listed species are considered as being likely to occur within the Project Area, namely *Goodenia byrnesii* (P3) and *Goodenia sepalosa* var. *glandulosa* (P3). This assessment is based on the presence of suitable habitat within the Project Area for these species, and due to the presence of nearby recent records. An additional four species are considered as having the potential to occur within the Project Area, based on the presence of marginally suitable habitat and close proximity of previous records. A total of 27 flora species are considered as being unlikely to occur and one species, *Phyllanthus fuernrohrii* (P3), has been previously misidentified and therefore is considered as not occurring within the Project Area. The full flora likelihood of occurrence assessment is provided in **Appendix C**.

4.2.4. Range extensions

Four species were recorded within the Project Area as representing range extensions (RE), namely *Cajanus latisepalus*, *Lindernia chrysoplectra, Lindernia clausa* and *Tephrosia remotiflora*.

Cajanus latisepalus is currently known from 60 records in WA, over a range of approximately 500 km from Meda in the west across to the Northern Territory (NT) border in the east (DBCA 2007-2021). Within the Project Area, this species was recorded from one quadrat location; ELA29, within the AgBc vegetation community on moist light brown clay loam flats. This record represents a minor range extension of approximately 60 km to the southwest of the known range of this species.

Lindernia chrysoplectra is currently known from 12 records in WA, over a range of approximately 465 km from the Dampier Peninsula in the northwest to 180 km west of Sturt Creek in the southeast (DBCA 2007-2021). Within the Project Area, this species was recorded from one quadrat location; ELA64, within the CbEc vegetation community on waterlogged dark brown sandy clay on open depression. This record represents a range infill, joining the eastern and western populations of this species, with the closest records of this species approximately 170 km to the west and 150 km to the east-southeast of the Project Area.

Lindernia clausa is currently known from 22 records in WA, over a range of approximately 675 km from the Dampier Peninsula in the southwest to near Kununurra in the east (DBCA 2007-2021). Within the Project Area, this species was recorded from three quadrat locations; ELA26, ELA27 and ELA31, within the BcTc and Ag vegetation communities on moist brown clay on open depression. This record represents a range extension of approximately 110 km to the south of the known range of this species.

Tephrosia remotiflora is currently known from 53 records in WA, over a range of approximately 1,795 km from near Onslow in the south Kununurra and into the NT in the north (DBCA 2007-2021). Within the Project Area, this species was recorded from one quadrat location; ELA01, within the AgCgEc vegetation community on red brown sandy loam on a gentle slope. This record represents a minor range extension of approximately 65 km to the south of the known range of this species.

Locations of flora species recorded as range extensions within the Project Area is presented in **Figure 9**.

4.2.5. Introduced flora

A total of nine introduced flora (weed) species were recorded within the Project Area:

- **Calotropis procera* (Calotrope);
- **Cenchrus setiger* (Birdwood Grass);
- **Malvastrum americanum* (Spiked Malvastrum);
- **Melochia pyramidata* (Pyramid Flower);
- **Portulaca oleracea* (Common Purslane);
- **Portulaca pilosa* (Pink Purslane);
- **Stylosanthes hamata* (Verano Stylo);
- **Trianthema pilosum*; and
- **Vachellia farnesiana* (Mimosa Bush).

Of these species, **Calotropis procera* is listed as a Declared Pest – s22(2) under the State *Biosecurity and Agriculture Management Act 2007* (BAM Act). Declared Pests "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2021b). **Calotropis procera* was recorded from within five quadrats in the Project Area, namely ELA20, ELA33, ELA35, ELA59 and ELA60 (**Plate 2**). Of the remaining eight introduced (weed) species, all are classified under the BAM Act (2007) as permitted (s11) for the whole state and not assigned any control category for a local government area at this time. **Stylosanthes hamata* and **Portulaca pilosa* were the most commonly recorded weed species, recorded at 18 and 13 quadrats, respectively. Locations of weeds within the Project Area is provided in **Appendix I**.

Plate 2: ****Calotropis procera* (Calotrope), listed as a Declared Pest – s22(2) under the BAM Act, recorded within the Project Area

4.2.6. Vegetation communities

A total of 13 vegetation communities were delineated and mapped within the Project Area (**Appendix J**). Vegetation community CgAgBc was the most widespread across the Project Area, covering 20.05 ha (15.64% of the Project Area; **Table 9**; **Figure 10**).

Table 9: Vegetation communities recorded within the Project Area

Photo	Code	Description	Associated species	Quadrats	Similarity %	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
	AgCgEc	*Adansonia gregorii* mid isolated trees and *Corymbia greeniana, Erythrophleum chlorostachys, Bauhinia cunninghamii* low open woodland over *Acacia colei, Grevillea pyramidalis, Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low open hummock grassland and *Sorghum plumosum, Chrysopogon fallax* tall open tussock grassland.	*Aristida holathera, Atalaya hemiglauca, Cajanus marmoratus, Cassytha filiformis, Corchorus sidoides* subsp. *sidoides, Dolichandrone occidentalis, Euphorbia psilosperma, Evolvulus alsinoides* var. *decumbens, Gomphrena canescens, Hakea macrocarpa, Indigofera colutea, Phyllanthus maderaspatensis, Pluchea tetranthera, Polymeria ambigua, Terminalia canescens, Tinospora smilacina, Triodia intermedia.*	ELA01, ELA02, ELA03, ELA41, ELA42	45.12	11.44 (10.18)	1.25 (7.96)	12.69 (9.91)
	EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Corchorus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.	*Boerhavia coccinea, Carissa lanceolata, Corchorus sidoides* subsp. *vermicularis, Corymbia greeniana, Phyllanthus maderaspatensis, Polymeria ambigua, Senna notabilis, Spermacoce occidentalis, Sporobolus australasicus.*	ELA04, ELA09, ELA10, ELA11, ELA12, ELA55	38.95	1.15 (1.02)	1.31 (8.36)	2.46 (1.92)

Photo	Code	Description	Associated species	Quadrats	Similarity %	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
	CgAgBc	*Corymbia greeniana*, *Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei*, *Hakea arborescens*, *Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa*, *Aristida hygrometrica* low sparse grassland.	*Bonamia linearis, Carissa lanceolata, Dolichandrone occidentalis, Fimbristylis ferruginea, Gomphrena canescens, Goodenia armitiana, Gossypium australe, Grevillea pyramidalis, Hakea macrocarpa, Indigofera linnaei, Pluchea tetranthera, Sporobolus australasicus, Stylosanthes hamata.*	ELA05, ELA06, ELA07, ELA08, ELA14, ELA15, ELA16, ELA22, ELA44, ELA46	44.89	14.24 (12.66)	5.81 (37)	20.05 (15.64)
	CbEc	*Corymbia bella*, *Eucalyptus coolabah* mid open woodland over *Acacia colei*, *Lophostemon grandiflorus* subsp. *riparius*, *Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica*, *Eriachne obtusa* low sparse grassland.	*Arivela viscosa, Corchorus sidoides* subsp. *sidoides, Dolichandrone occidentalis, Eragrostis eriopoda, Evolvulus alsinoides* var. *villosicalyx, Fimbristylis ferruginea, Indigofera linifolia, Marsilea hirsuta, Nymphoides beaglensis* (P3), *Peplidium muelleri, Stylosanthes hamata.*	ELA13, ELA47, ELA56, ELA57, ELA58, ELA64	25.42	1.77 (1.58)	3.93 (25.07)	5.71 (4.45)

Photo	Code	Description	Associated species	Quadrats	Similarity %	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
	CgCzBc	*Corymbia greeniana*, *Corymbia zygophylla*, *Bauhinia cunninghamii* low open woodland over *Acacia platycarpa*, *Grevillea pyramidalis*, *Atalaya hemiglauca* tall sparse shrubland over *Sorghum plumosum*, *Sorghum stipoides* tall open tussock grassland and *Aristida latifolia* mid sparse tussock grassland.	*Bonamia pannosa, Carissa lanceolata, Chamaecrista symonii, Chrysopogon* fallax*, Corchorus sidoides* subsp. *sidoides, Crotalaria ramosissima, Eriachne obtusa, Gomphrena canescens, Gyrocarpus americanus, Ptilotus calostachyus, Terminalia platyphylla, Trichodesma zeylanicum* var. *zeylanicum, Waltheria indica.*	ELA17, ELA18, ELA20	48.07	11.33 (10.07)	1.51 (9.64)	12.84 (10.02)
	AgBc	*Adansonia gregorii* mid isolated trees and *Bauhinia cunninghamii* low open woodland over *Grevillea pyramidalis*, *Hakea arborescens*, *Hakea macrocarpa* tall sparse shrubland over *Indigofera colutea* low sparse shrubland, *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa* low sparse grassland.	*Abutilon otocarpum, Acacia ancistrocarpa, Acacia colei, Aristida hygrometrica, Atalaya hemiglauca, Boerhavia coccinea, Cajanus marmoratus, Carissa lanceolata, Corchorus sidoides* subsp. *sidoides, Dolichandrone occidentalis, Euphorbia schultzii* var. *comans, Gomphrena canescens, Gossypium australe, Indigofera linifolia, Pluchea tetranthera, Pterocaulon intermedium, Stylosanthes hamata, Trichodesma zeylanicum* var. *zeylanicum, Triodia intermedia.*	ELA19, ELA21, ELA29, ELA30	47.38	12.35 (10.98)	0 (0)	12.35 (9.64)

Photo	Code	Description	Associated species	Quadrats	Similarity %	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
	BcCg	*Bauhinia cunninghamii*, *Corymbia greeniana* low open woodland over *Hakea macrocarpa*, *Grevillea pyramidalis*, *Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.	*Acacia ancistrocarpa, Atalaya hemiglauca, Boerhavia coccinea, Cajanus marmoratus, Carissa lanceolata, Corchorus sidoides* subsp. *sidoides, Crotalaria brevis, Gomphrena canescens, Gossypium australe, Heliotropium diversifolium, Pluchea tetranthera, Polygala tepperi, Polymeria ambigua, Rhynchosia minima, Sehima nervosum, Terminalia canescens, Trichodesma zeylanicum* var. *zeylanicum.*	ELA23, ELA24, ELA25, ELA38	52.20	3.3 (2.94)	0 (0)	3.3 (2.58)
	BcTc	*Bauhinia cunninghamii*, *Terminalia canescens* low open woodland over *Grevillea pyramidalis*, *Acacia ancistrocarpa*, *Acacia colei* tall sparse shrubland over *Triodia intermedia*, *Triodia bitextura* low sparse hummock grassland and *Sorghum plumosum* tall open tussock grassland.	*Alysicarpus muelleri, Arivela tetrandra, *Cenchrus setiger, Corchorus sidoides* subsp. *vermicularis, Eriachne obtusa, Gomphrena brachystylis* subsp. *pindanensis, Goodenia sepalosa* var. *sepalosa, Gossypium australe, Hakea macrocarpa, Indigofera colutea, Indigofera linnaei, Perotis rara, Phyllanthus maderaspatensis, Pluchea tetranthera, Ptilotus corymbosus, Rhynchosia minima, Spermacoce occidentalis, Sporobolus australasicus, Stylosanthes hamata.*	ELA26, ELA27, ELA28	52.31	7.25 (6.45)	0 (0)	7.25 (5.66)

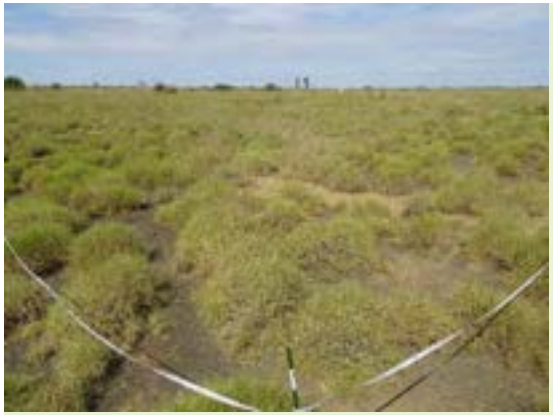
Photo	Code	Description	Associated species	Quadrats	Similarity %	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
	Ag	*Adansonia gregorii* mid open woodland over *Grevillea pyramidalis*, *Hakea chordophylla*, *Dolichandrone occidentalis* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall sparse tussock grassland and *Aristida holathera* low sparse grassland.	*Aristida hygrometrica, Boerhavia coccinea, Buchnera ramosissima, Corchorus sidoides* subsp. *vermicularis, Crotalaria medicaginea* var. *neglecta, Euphorbia psilosperma, Fimbristylis schultzii, Goodenia sepalosa* var. *sepalosa, Gossypium australe, Indigofera colutea, Indigofera linifolia, Indigofera linnaei, Pluchea tetranthera, Polymeria ambigua, Portulaca digyna, Pterocaulon intermedium, Rhynchosia minima, Sporobolus australasicus, Trichodesma zeylanicum* var. *zeylanicum, Urochloa holosericea.*	ELA31, ELA33, ELA39, ELA40	55.10	9.16 (8.14)	0 (0)	9.16 (7.15)
	AtAcDo	*Atalaya hemiglauca*, *Acacia synchronicia*, *Dolichandrone occidentalis* tall sparse shrubland over *Carissa lanceolata*, *Gossypium australe*, *Chamaecrista symonii* low sparse shrubland over *Triodia intermedia*, *Triodia wiseana* low hummock grassland and *Eriachne obtusa* low sparse grassland.	*Abutilon otocarpum, Aristida latifolia, Arivela viscosa, Blumea integrifolia, Blumea tenella, Dactyloctenium radulans, Eragrostis tenellula, Fimbristylis schultzii, Gomphrena canescens, Indigofera linifolia, Indigofera linnaei, Ipomoea coptica, Panicum decompositum, Pluchea tetranthera, Sorghum plumosum, Sporobolus australasicus, Xerochloa barbata.*	ELA32, ELA34, ELA35, ELA36, ELA37	37.41	12.38 (11.01)	0 (0)	12.38 (9.66)

Photo	Code	Description	Associated species	Quadrats	Similarity %	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
	BcGaCg	*Bauhinia cunninghamii, Gyrocarpus americanus, Corymbia greeniana* low open woodland over *Acacia platycarpa*, *Acacia tumida* tall open shrubland and *Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low sparse hummock grassland and *Aristida hygrometrica*, *Eriachne obtusa* low sparse grassland.	*Arivela viscosa, Boerhavia coccinea, Bonamia linearis, Bonamia pannosa, Cajanus marmoratus, Corchorus sidoides* subsp. *sidoides, Corymbia zygophylla, Dolichandrone occidentalis, Ehretia saligna, Euphorbia psilosperma, Euphorbia schultzii* var. *comans, Perotis rara, Polymeria ambigua, Tephrosia rosea, Trianthema pilosum.*	ELA43, ELA45, ELA51, ELA62, ELA63	46.62	11.45 (10.18)	1.88 (11.95)	13.33 (10.4)
	EcCg	*Erythrophleum chlorostachys, Corymbia greeniana* low open woodland over *Acacia tumida*, *Acacia ancistrocarpa* tall sparse shrubland and *Carissa lanceolata* mid sparse shrubland over *Bonamia pannosa*, *Bonamia linearis* low sparse shrubland and *Aristida hygrometrica* low open grassland.	*Aristida latifolia, Atalaya hemiglauca, Bauhinia cunninghamii, Boerhavia coccinea, Corchorus sidoides* subsp. *sidoides, Cynodon convergens, Cyperus blakeanus, Dodonaea hispidula* var. *arida, Eragrostis eriopoda, Eucalyptus coolabah, Euphorbia psilosperma, Gomphrena canescens, Gossypium australe, Melaleuca alsophila, Pluchea tetranthera, Sorghum plumosum, Triodia bitextura, Waltheria indica.*	ELA48, ELA49, ELA53, ELA54	51.43	4.68 (4.16)	0 (0)	4.68 (3.65)

Photo	Code	Description	Associated species	Quadrats	Similarity %	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
	CzEcCg	*Corymbia zygophylla*, *Erythrophleum chlorostachys*, *Corymbia greeniana* low open woodland over *Acacia tumida*, *Acacia platycarpa* tall sparse shrubland and *Waltheria indica* low sparse shrubland over *Triodia bitextura*, *Triodia wiseana* low open hummock grassland and *Eriachne obtusa* low sparse grassland.	*Abutilon otocarpum, Aristida hygrometrica, Aristida latifolia, Bonamia linearis, Bonamia pannosa, Cajanus marmoratus, Chamaecrista symonii, Corchorus sidoides* subsp. *sidoides, Corynotheca micrantha, Dolichandrone occidentalis, Ehretia saligna, Euphorbia schultzii* var. *comans, Grevillea wickhamii, Melaleuca alsophila, Polymeria ambigua, Sorghum plumosum, Tephrosia rosea, Tinospora smilacina.*	ELA50, ELA52, ELA59, ELA60, ELA61	44.64	11.95 (10.63)	0 (0)	11.95 (9.33)
Total						**112.46 (100)**	**15.69 (100)**	**128.15 (100)**

4.2.7. Vegetation of conservation significance

None of the vegetation associations delineated within the Project Area were inferred to represent any known or potential conservation significant communities listed under the EPBC Act, the BC Act or by DBCA. A DBCA Threatened and Priority Communities database search (DBCA 2018c) identified three known occurrences of PECs within 50 km of the Project Area, namely the Kimberley Vegetation Association 760 (listed as P1), described as 'shrublands, pindan; *Acacia tumida* shrubland with scattered low bloodwood & *Eucalyptus setosa* (excluded name) over ribbon & curly spinifex', the Kimberley Vegetation Association 759 (listed as P3), described as 'grasslands, tall bunch grass savanna woodland, coolabah over ribbon/blue grass (*Bothriochloa* spp.)' and the Leopold Land System (listed as P3), described as 'cracking clay plains and marginal outcrop alluvial plains, grasslands and very open grassy woodlands'. None of the 13 vegetation associations delineated within the Project Area are inferred as representing these PECs.

4.2.8. Vegetation condition

Vegetation recorded within the Project Area ranged from Excellent to Poor based on the vegetation condition scale adapted from Keighery (1994) and Trudgen (1988) provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016; **Table 10**). Majority of the vegetation within the Project Area was classed as Very Good (69.93 ha; 54.57% of the Project Area) and Excellent (45.28 ha; 35.34% of the Project Area; **Figure 11**). Disturbances within the Project Area included impacts from pastoral activities (e.g. cattle grazing, scats and tracks), previous clearing and adjacent tracks which facilitate edge effects and minor weed invasion. The Project Area also has prevalence of fire with many areas being recently burnt across the landscape, particularly preceding the field survey in May.

Table 10: Vegetation condition within the Project Area

Vegetation condition	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
Excellent	38.89 (34.58)	6.40 (40.76)	45.28 (35.34)
Very Good	62.48 (55.56)	7.45 (47.50)	69.93 (54.57)
Good	8.84 (7.86)	1.84 (11.73)	10.68 (8.34)
Poor	2.25 (2)	0 (0)	2.25 (1.75)
Degraded	0 (0)	0 (0)	0 (0)
Completely Degraded	0 (0)	0 (0)	0 (0)
Total	**112.46 (100)**	**15.69 (100)**	**128.15 (100)**

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4.3. Fauna survey

4.3.1. Fauna habitats

A total of three broad fauna habitat types were mapped across the Project Area. These fauna habitats align with vegetation communities described in Section 4.2.6 above. Fauna habitat 1 was the most common within the Project Area, occurring across 81.86 ha (63.88%) of the Project Area. Fauna habitats are described in **Table 11** and presented in **Figure 12** below.

Table 11: Fauna habitat of the Project Area

Fauna habitat description	Associated vegetation community	Extent (ha) within the Disturbance Footprint (% total)	Extent (ha) within the Additional Survey Area (% total)	Total extent (ha) within the Project Area (% total)
Fauna habitat 1: Mixed open woodland over grassland on sandy clay flats and slopes	Ag, AgBc, AgCgEc, AtAcDo, BcCg, BcTc, CgAgBc	74.80 (66.52)	7.06 (44.69)	81.86 (63.88)
Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests	BcGaCg, CgCzBc, CzEcCg, EcCg	34.73 (30.88)	3.39 (21.60)	38.12 (29.75)
Fauna habitat 3: Eucalypt open woodland and mixed shrubland on closed depression and creekline	CbEc, EmEcAg	2.92 (2.6)	5.25 (33.44)	8.17 (6.37)
Total		**112.46 (100)**	**15.69 (100)**	**128.15 (100)**

4.3.2. Fauna overview

A total of 75 fauna species were recorded during the field survey. This number comprised of 52 birds, five mammals, eight reptiles and ten invertebrates. Two introduced fauna species, European Cattle (**Bos indicus*) and Dingo (**Canis familiaris dingo*), were directly observed in the Project Area. A full fauna species list is presented in **Appendix K**.

4.3.3. Conservation significant fauna

One fauna species of conservation significance was recorded within the Project Area; namely the Greater Bilby (*Macrotis lagotis*), listed as VU under the EPBC Act and BC Act. Evidence of this species in the form of diggings was recorded at four locations in the south-east of the Project Area within Fauna habitat 2 (**Table 12**; **Figure 13**). Greater Bilby diggings have a conical shape, which is a distinguishing feature of this species (Moseby *et al*. 2012, DSEWPaC 2011). Diggings were relatively fresh and intact (i.e. had not completely collapsed or washed away) and estimated to be less than one year old. No direct observations of this species were made.

Table 12: *Macrotis lagotis* (Greater Bilby) diggings recorded within the Project Area

Species	Conservation listing		Observation type	Coordinates		Photo
	EPBC Act	BC Act		Easting	Northing	
Macrotis lagotis (Greater Bilby)	VU	VU	Digging	716952	7976430	
Macrotis lagotis (Greater Bilby)	VU	VU	Digging	716839	7976443	

Species	Conservation listing		Observation type	Coordinates		Photo
	EPBC Act	BC Act		Easting	Northing	
Macrotis lagotis (Greater Bilby)	VU	VU	Digging	708708	7981144	
Macrotis lagotis (Greater Bilby)	VU	VU	Digging	708741	7979737	

Of the initial 54 conservation listed fauna species identified from the pre-likelihood of occurrence survey assessment as possibly occurring within the Project Area, *Macrotis lagotis* (Greater Bilby) was the only species recorded within the Project Area. Of the remaining 53 species, nine of these are considered as having the potential to occur post-survey, based on proximity of previous records to the Project Area and availability of suitable habitat within the Project Area:

- *Erythrura gouldiae* (Gouldian Finch; listed as Endangered [EN] under the EPBC Act and as P4 by DBCA);
- *Falco hypoleucos* (Grey Falcon; listed as VU under the EPBC Act and BC Act);
- *Actitis hypoleucos* (Common Sandpiper; listed as Migratory [M] under EPBC Act and BC Act);
- *Apus pacificus* (Fork-tailed swift; listed as M under EPBC Act and BC Act);
- *Calidris acuminata* (Sharp-tailed sandpiper; listed as M under EPBC Act and BC Act);
- *Plegadis falcinellus* (Glossy ibis; listed as M under the EPBC Act and BC Act).
- *Falco peregrinus* (Peregrine falcon; listed as Other specially protected species [OS] under BC Act);
- *Ctenotus uber johnstonii* (Spotted ctenotus (northeast); listed as P2 by DBCA); and
- *Leggadina lakedownensis* (Northern short-tailed mouse; listed as P4 by DBCA).

Of these, six species are vagrant and / or mobile migratory bird species, which may utilise habitat within the Project Area only when conditions are favourable (e.g. after periods of heavy rainfall).

Of the remaining 44 species identified from the desktop assessment as possibly occurring within the Project Area, all are considered as unlikely to occur within the Project Area based on lack of suitable habitat present and nearby recent records of these species. The fauna likelihood of occurrence assessment is presented in **Appendix D**.

4.4. Aboriginal significant bush foods

Two Aboriginal significant bush food (flora) species were recorded within the Project Area, namely *Adansonia gregorii* (Boab) and *Carissa lanceolata* (Conkerberry). *Adansonia gregorii* was recorded as a dominant or associated species within five of the 14 vegetation communities described, at a <5% cover (AgCgEc, EmEcAg, CgAgBc, AgBc, Ag). Of note was one particularly large tree occurring across a portion of the track leading to the Midgard well site (m 685634E; m 7992864N). This tree was estimated to have a diameter of between 5 and 6 m. *Carissa lanceolata* was recorded as a dominant or associated species within ten of the 14 vegetation communities described, at a <5% cover (AgCgEc, EmEcAg, CgAgBc, CgCzBc, AgBc, BcCg, AtAcDo, AtAcDo, BcGaCg, EcCg).

Three Aboriginal significant bush food (fauna) species were recorded within the Project Area, namely *Ardeotis australis* (Australian Bustard), *Osphranter rufus* (Red Kangaroo), *Varanus gouldii* (Sand Goanna) and *V. panoptes* (Yellow-spotted Monitor). Australian Bustard was recorded from one location within the Project Area (m 683743E; m 7992977 N). Red Kangaroo was recorded from scats throughout the Project Area and spotted in the distance at various locations. Sand Goanna and Yellow-spotted Monitor were spotted several times sunbaking along tracks within and adjacent to the Project Area.

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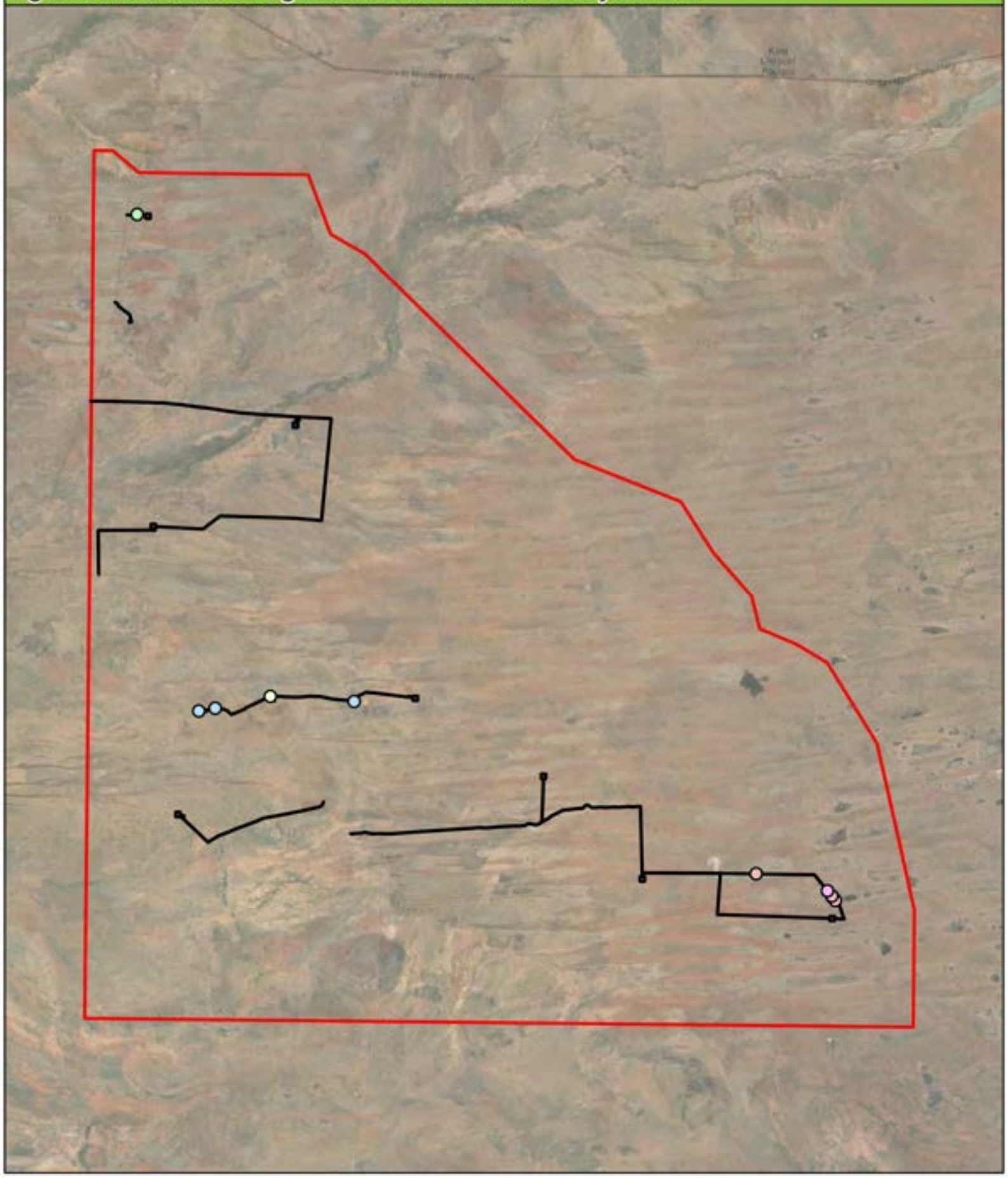
Figure 9: Locations of significant flora within the Project Area



Legend

Development Envelope

Significant FloraSpecies

- *Nymphoides beaglensis (P3)*
- *Cajanus latisepalus (RE)*
- *Lindernia chrysoplectra (RE)*
- *Lindernia clausa (RE)*
- *Tephrosia remotiflora (RE)*

0 1.75 3.5 7

Kilometers

Datum/Projection:
GDA 1994 MGA Zone 51

N

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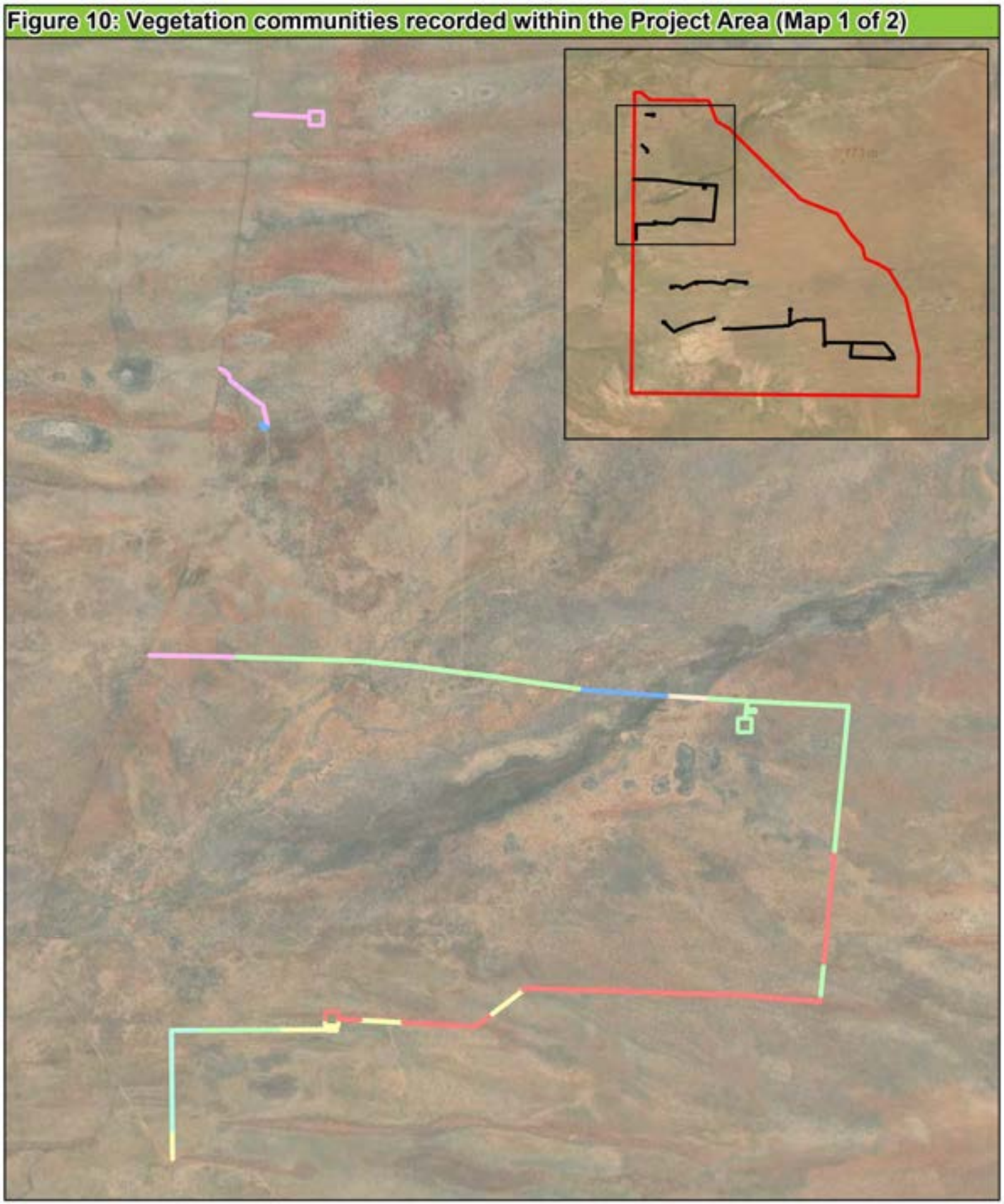
Figure 10: Vegetation communities recorded within the Project Area (Map 1 of 2)



Legend

- Development Envelope
- Project Area

Vegetation Community

- AgBc
- AgCgEc
- BcCg
- CbEc
- CgAgBc
- CgCzBc
- EmEcAg

0 0.5 1 2
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 51

N

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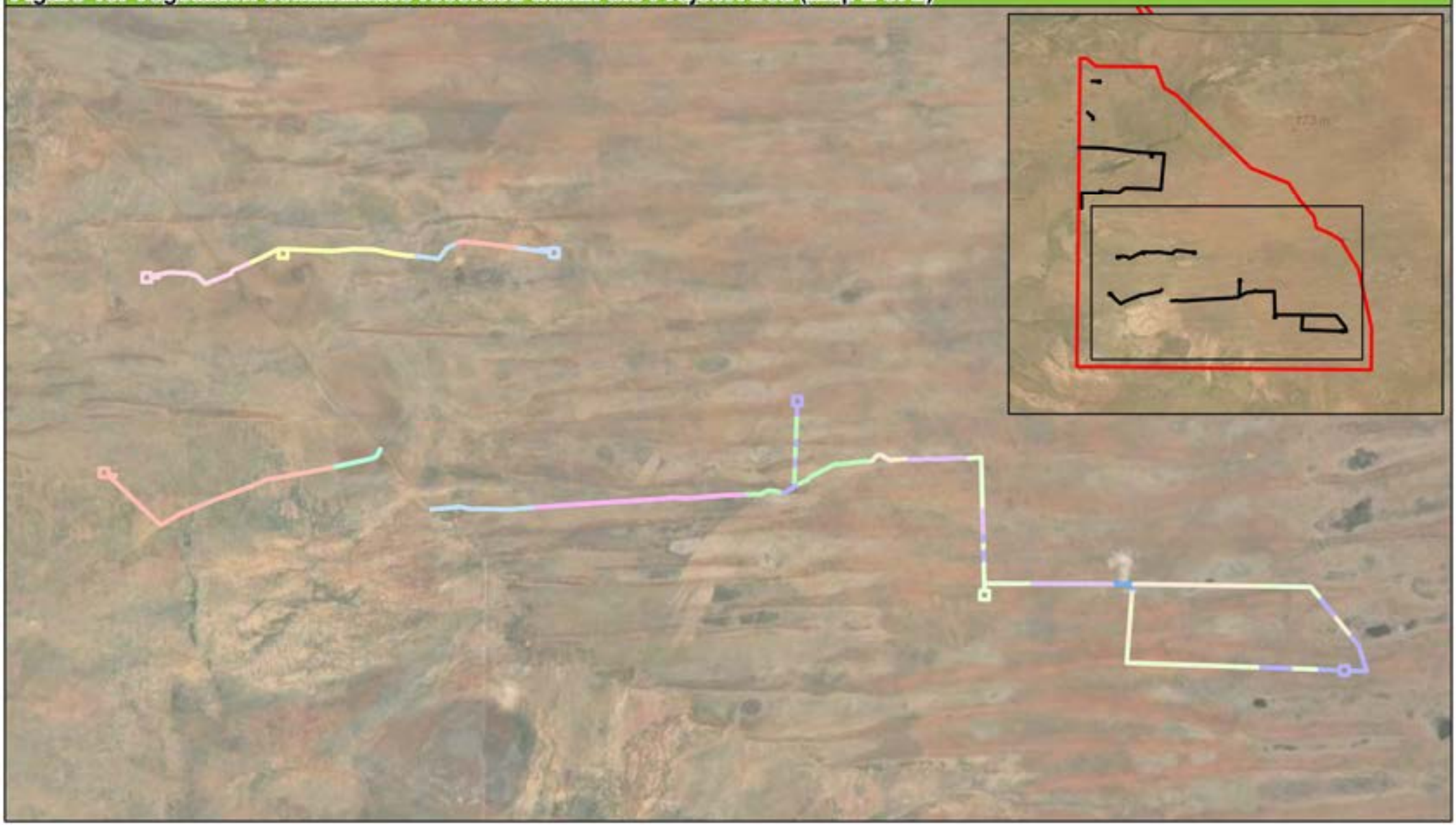
Prepared by: DD-17692 Date: 7/07/2021

Figure 10: Vegetation communities recorded within the Project Area (Map 2 of 2)



Legend

- Development Envelope
- Project Area

Vegetation Community

- Ag
- AgBc
- AgCgEc
- AtAcDo
- BcCg
- BcGaCg
- BcTc
- CbEc
- CgAgBc
- CzEcCg
- EcCg
- EmEcAg

0 1,000 2,000 4,000
Metres

Datum/Projection:
GDA 1994 MGA Zone 51

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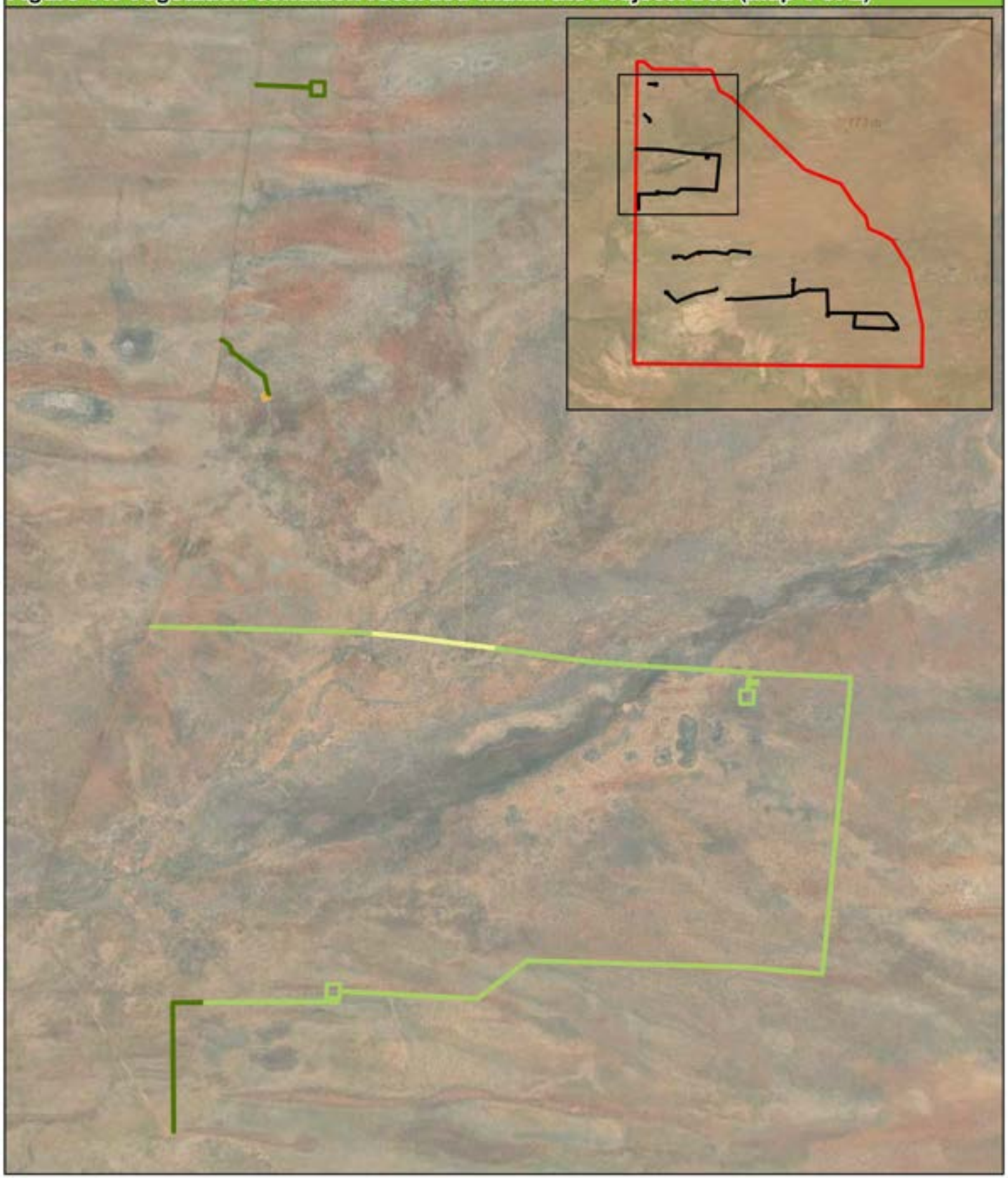
Figure 11: Vegetation condition recorded within the Project Area (Map 1 of 2)



Legend

- Development Envelope
- Project Area

Vegetation Condition

- Excellent
- Very Good
- Good
- Poor

0 0.5 1 2
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 51

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Prepared by: DD-17892 Date: 7/07/2021

Figure 11: Vegetation condition recorded within the Project Area (Map 2 of 2)

Legend

- Development Envelope
- Project Area

Vegetation Condition

- Excellent
- Very Good
- Good
- Poor

0 1,000 2,000 4,000

Metres

Datum/Projection:
GDA 1994 MGA Zone 51

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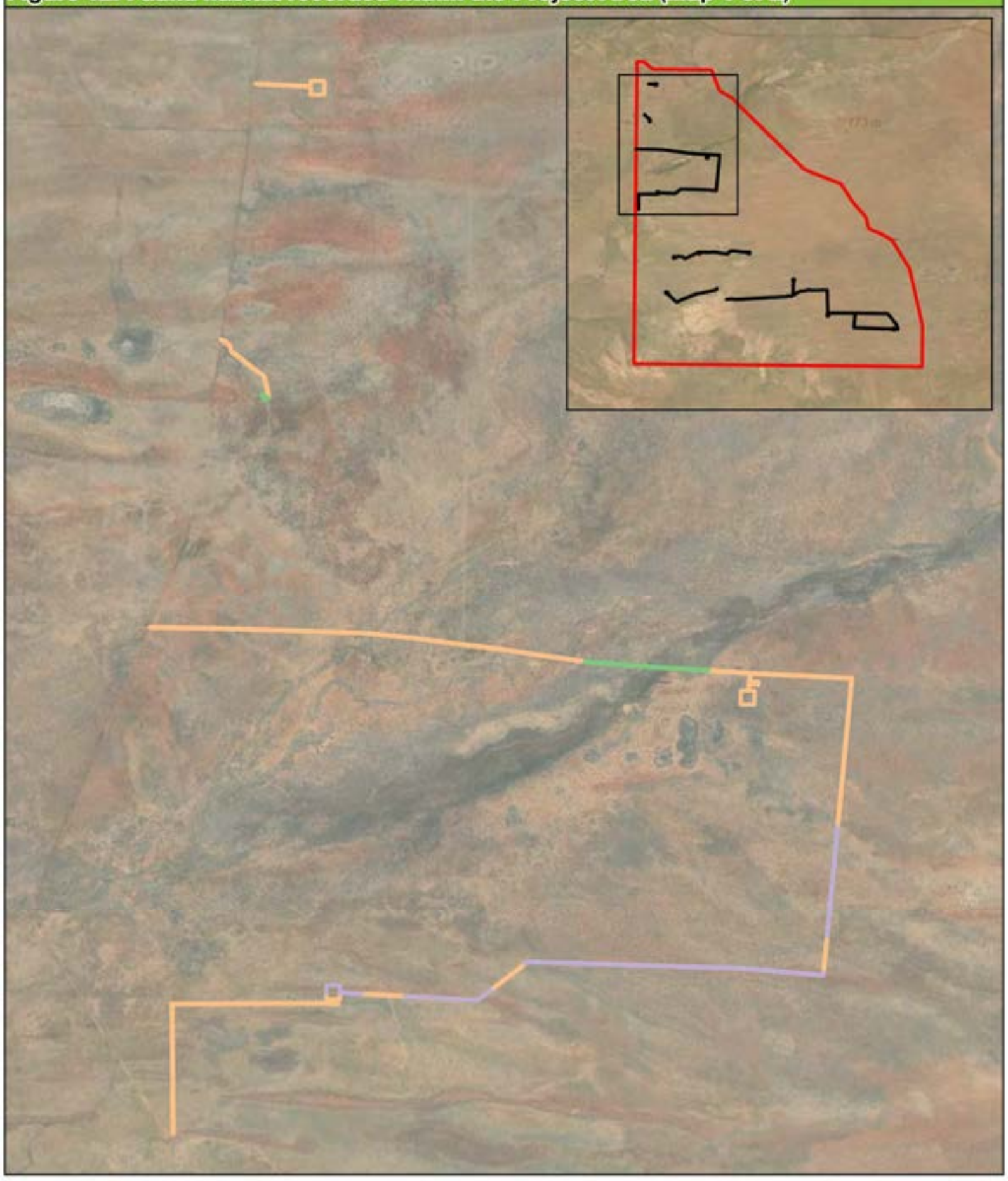
Prepared by: DD-17692 Date: 7/07/2021

Figure 12: Fauna habitat recorded within the Project Area (Map 1 of 2)



Legend

- Development Envelope
- Project Area

Fauna Habitat

- Fauna habitat 1: Mixed open woodland over grassland on sandy clay flats and slopes
- Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests
- Fauna habitat 3: Eucalypt open woodland and mixed shrubland on closed depression and creekline

0 500 1,000 2,000
Metres

Datum/Projection:
GDA 1994 MGA Zone 51

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Figure 12: Fauna habitat recorded within the Project Area (Map 2 of 2)

Legend

- Development Envelope
- Project Area

Fauna Habitat

- Fauna habitat 1: Mixed open woodland over grassland on sandy clay flats and slopes
- Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests
- Fauna habitat 3: Eucalypt open woodland and mixed shrubland on closed depression and creekline

0 1,000 2,000 4,000
Metres
Datum/Projection:
GDA 1994 MGA Zone 51

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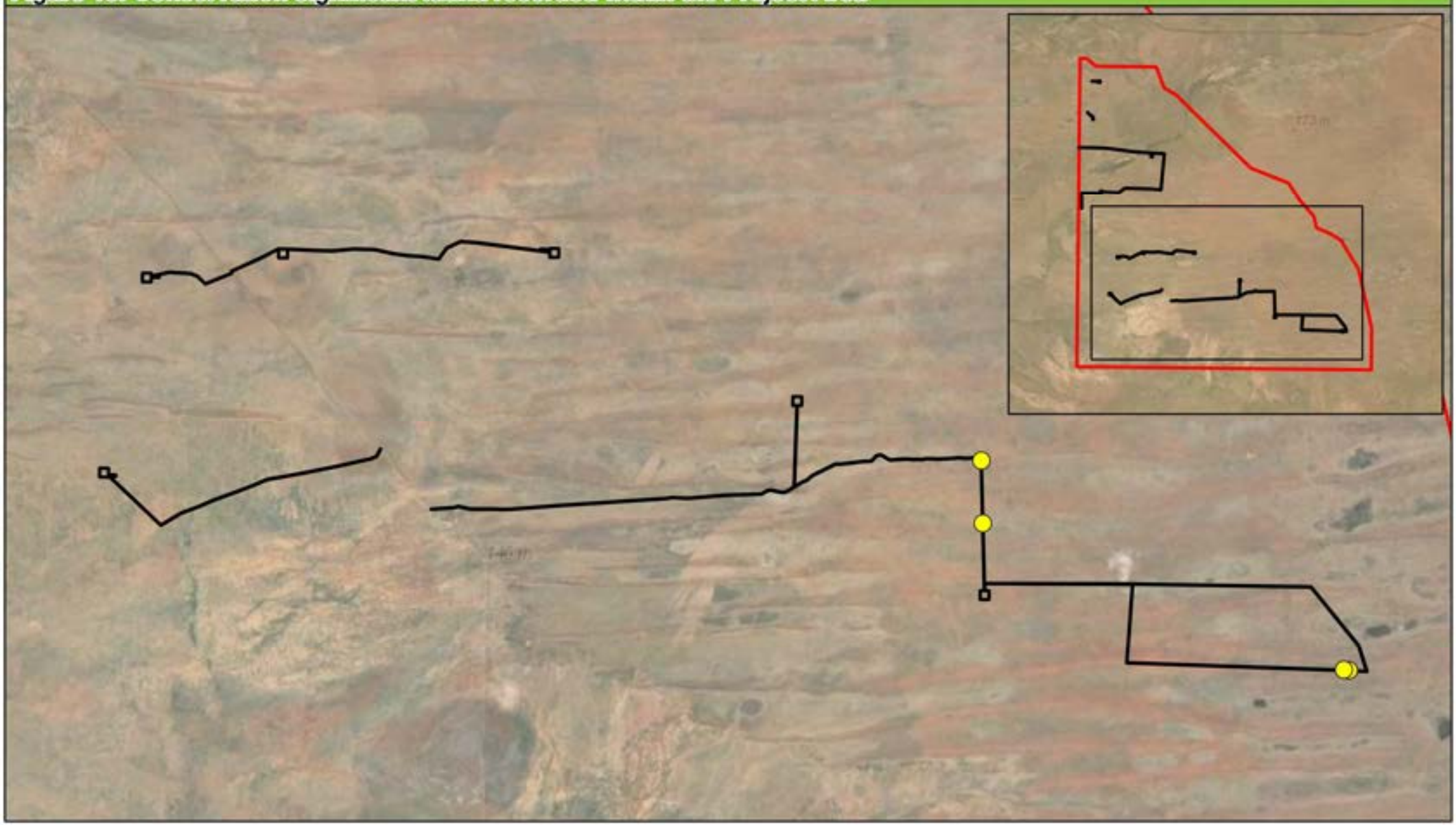
Figure 13: Conservation significant fauna recorded within the Project Area



Legend

- Development Envelope
- Project Area

Conservation Significant Fauna

- *Macrotis lagotis* (Greater Bilby; VU) diggings

0 1,000 2,000 4,000

Metres

Datum/Projection:
GDA 1994 MGA Zone 51

N

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Prepared by: DD-17692 Date: 16/07/2021

5. Discussion

5.1. Flora and vegetation

5.1.1. Flora overview

A total of 235 flora species representing 54 families and 130 genera were recorded from the 64 quadrats established within the Project Area. Average species richness per quadrat was 27 species, ranging from a low of 7 species in ELA57 to a high of 53 species in ELA39. A species accumulation curve determined that the number of flora species recorded represents approximately 91.7% of the species potentially present within the Project Area. This high percentage indicates that a suitable proportion of flora potentially present within the Project Area were recorded, reflecting the common occurrence of key species across the landscape, which co-occur at varying levels of structural and compositional dominance. This number is also greater than that recorded from Reconnaissance level studies in the region conducted in 2012 (Low Ecological Services 2012b; 150 flora species recorded) and 2020 (Low Ecological Services 2020; 97 flora species recorded), who recorded a similar suite of species in their respective studies.

5.1.2. Conservation significant flora

No Threatened flora listed under the EPBC Act or the BC Act were recorded within the Project Area. These findings are consistent with results from the desktop review undertaken for the Project Area, which included a review of Commonwealth and State database searches and previous relevant studies in the region (Section 4.1), with no Threatened flora species recorded or identified as likely to occur in the local region from this review.

One Priority flora species, *Nymphoides beaglensis* (listed as P3 by DBCA), was recorded within the Project Area. Priority 3 species are poorly known species in need of further survey (**Appendix A**). *Nymphoides beaglensis* is an annual aquatic herb with white to pink and purple flowers from March to June (DBCA and WAH 2021). It is known from 20 records over a range of approximately 475 km from Roebuck in the southwest to the Mitchell Plateau in the northeast, with the nearest known record located approximately 38 km northwest of the Project Area (DBCA 2007-2021). The species is known to occur in shallow fresh water at the edges of permanent waterholes or in seasonally inundated claypans and depressions (DBCA and WAH 2021). Within the Project Area, *Nymphoides beaglensis* was recorded from eight point-locations totalling 112 individuals, all of which were found within seasonally inundated depressions within the CbEc vegetation community in the Additional Survey Area. This species was flowering at the time of the field survey in March.

Of the 35 conservation significant flora species identified from the pre-survey likelihood of occurrence assessment as possibly occurring within the Project Area, *Nymphoides beaglensis* was the only species recorded. Based on the post-survey likelihood of occurrence assessment, two of the remining 34 conservation significant flora species are considered as being likely to occur within the Project Area, namely *Goodenia byrnesii* (P3) and *Goodenia sepalosa* var. *glandulosa* (P3). *Goodenia byrnesii* is considered as likely to occur due to the presence of potentially suitable habitat and associated species occurring within the Project Area, e.g. sandy creek edges with *Bauhinia cunninghamii* scattered low trees and grasses (DBCA and WAH 2021). Known records of this species also occur within 1 km of the Project Area. *Goodenia sepalosa* var. *glandulosa* is considered as likely to occur due to the presence of

potentially suitable habitat and associated species occurring within the Project Area, e.g. red sand or loam with *Bauhinia cunninghamii* open woodland over *Acacia tumida* var. *tumida* tall shrubland (DBCA and WAH 2021). Known records of this species also occur approximately 15 km to the west of the Project Area.

Of note, *Trianthema kimberleyi* (P1), *Goodenia virgata* (P2) and *Triodia acutispicula* (P3) were identified as having been recorded within previous survey reports in the local area, as outlined in **Table 8** above. Suitable habitat for *Trianthema kimberleyi* does not occur within the Project Area (e.g. shistous soils). Although Low Ecological Services (2012b) recorded this species <10 km from the Project Area, known information suggests that this species occurs only on schistous soils, a soil type that was not recorded within the Project Area. Additionally, the single known WAH record of this species occurs >200 km to the southeast of the Project Area. Suitable habitat for *Goodenia virgata* does not occur within the Project Area (e.g. red sandy loam near salt pans). Although Woodman Environmental Consulting (2007) recorded this species approximately 5 km from the Project Area, known information suggests that this species occurs near salt lakes, a habitat type not found within the Project Area. Additionally, WAH records all occur well to the south and southeast (>400 km) and are associated with inland saltpans. Although marginal habitat may occur within the Project Area for *Triodia acutispicula* (e.g.Pindan plains), this species predominantly occurs on river levees and rocky hillslopes and outcrops (DBCA and WAH 2021). Although Woodman Environmental Consulting (2007) recorded this species <5 km from the Project Area, known information shows that the majority of populations occur well to the north (>300 km from the Project Area). The nearest WAH record occurs >200 km to the north east at Mornington Camp. Based on current habitat information available for these species on Florabase (DBCA and WAH 2021), and from on-ground vegetation/habitat mapping, these three species are considered as being unlikely to occur within the bounds of the Project Area.

The post-survey likelihood of occurrence assessment identified an additional four species are considered as having the potential to occur within the Project Area, based on the presence of marginally suitable habitat and close proximity of previous records, namely *Heliotropium foveolatum* (P1), *Acacia monticola* x *tumida* var. *kulparn* (P3), *Corchorus fitzroyensis* (P3) and *Tephrosia pedleyi* (P3). A total of 27 flora species are considered as being unlikely to occur and one species, *Phyllanthus fuernrohrii* (P3), has been previously misidentified and therefore is considered as not occurring within the Project Area.

5.1.3. Range extensions

A total of four flora species were recorded as range extensions within the Project Area, namely *Cajanus latisepalus*, *Lindernia chrysoplectra*, *Lindernia clausa* and *Tephrosia remotiflora*.

Cajanus latisepalus is an erect, spindly shrub with yellow pea flowers from March to August (DBCA and WAH 2021). It is known to grow in sandy or gravelly soils, sandstone and basalt on sandplains and rocky slopes (DBCA and WAH 2021). *Cajanus latisepalus* is currently known from 60 records in WA, over a range of approximately 500 km from Meda in the west across to the Northern Territory (NT) border in the east (DBCA 2007-2021). Within the Project Area, this species was recorded from one quadrat location; ELA29, within the AgBc vegetation community on moist light brown clay loam flats. This record represents a minor range extension of approximately 60 km to the southwest of the known range of this species.

Lindernia chrysoplectra is a delicate, fleshy-stemmed annual herb 0.1-0.3 m high with purple and white flowers from March to August (DBCA and WAH 2021). It is known to grow in sandy soils in seasonally wet areas (DBCA and WAH 2021). *Lindernia chrysoplectra* is currently known from 12 records in WA, over a range of approximately 465 km from the Dampier Peninsula in the northwest to 180 km west of Sturt Creek in the southeast (DBCA 2007-2021). Within the Project Area, this species was recorded from one quadrat location; ELA64, within the CbEc vegetation community on waterlogged dark brown sandy clay on open depression. This record represents a range infill, joining the eastern and western populations of this species, with the closest records of this species approximately 170 km to the west and 150 km to the east-southeast of the Project Area.

Lindernia clausa is a slender, erect annual herb 3 to 35 centimetres (cm) high with blue/purple flowers from February to August (DBCA and WAH 2021). It is known to grow on sand or loam on floodplains, creeklines or seepage areas (DBCA and WAH 2021). *Lindernia clausa* is currently known from 22 records in WA, over a range of approximately 675 km from the Dampier Peninsula in the southwest to near Kununurra in the east (DBCA 2007-2021). Within the Project Area, this species was recorded from three quadrat locations; ELA26, ELA27 and ELA31, within the BcTc and Ag vegetation communities on moist brown clay on open depression. This record represents a range extension of approximately 110 km to the south of the known range of this species.

Tephrosia remotiflora is a prostrate or sprawling sericeous shrubs 15 to 60 cm high with pink/ to purple flowers from February to June or September. (DBCA and WAH 2021). It is known to grow in red sand and sandstone on sand dunes and pindan (DBCA and WAH 2021). *Tephrosia remotiflora* is currently known from 53 records in WA, over a range of approximately 1,795 km from near Onslow in the south Kununurra and into the NT in the north (DBCA 2007-2021). Within the Project Area, this species was recorded from one quadrat location; ELA01, within the AgCgEc vegetation community on red brown sandy loam on a gentle slope. This record represents a minor range extension of approximately 65 km to the south of the known range of this species.

5.1.4. Introduced flora (weed) species

A total of nine introduced flora (weed) species were recorded within the Project Area, namely **Calotropis procera* (Calotrope), **Cenchrus setiger* (Birdwood Grass); **Malvastrum americanum* (Spiked Malvastrum), **Melochia pyramidata* (Pyramid Flower), **Portulaca oleracea* (Common Purslane), **Portulaca pilosa* (Pink Purslane), **Stylosanthes hamata* (Verano Stylo), **Trianthema pilosum* and **Vachellia farnesiana* (Mimosa Bush). Of these, **Calotropis procera* is listed as a Declared Pest – s22(2) under the State *Biosecurity and Agriculture Management Act 2007* (BAM Act). Declared Pests "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2021b).

**Calotropis procera* is a perennial shrub to tree in the Apocynaceae family, growing up to 4 m tall with smooth pale grey-green stems and a white milky sap. Flowers are purple to white with five waxy petals (DPIRD 2021b). This species distributed over much of northern Australia, in particular in Queensland, northwest WA and in northern parts of the NT, and is spread be seed over long distances by wind or through water or mud sticking to animals or vehicles. Its preferred habitat is disturbed sites, thriving on poor soils, particularly where overgrazing has removed competition from native grasses (Atlas of Living

Australia [ALA] 2021). **Calotropis procera* was recorded from within five quadrats in the Project Area, namely ELA20, ELA33, ELA35, ELA59 and ELA60.

Of the remaining eight introduced (weed) species, all are classified under the BAM Act (2007) as permitted (s11) for the whole state and not assigned any control category for a local government area at this time. **Stylosanthes hamata* and **Portulaca pilosa* were the most common weed species, being recorded at 18 and 13 quadrats, respectively. Given the prevalence of disturbance due to pastoral activities in the region, there is likely to be additional weeds to those that were recorded during the survey.

5.1.5. Vegetation communities and condition

A total of 13 vegetation communities were delineated and mapped within the Project Area, generally comprising broad mixtures of of *Adansonia gregorii*, *Corymbia* and *Eucalyptus* spp., *Atalaya hemiglauca, Bauhinia cunninghamii* and *Erythrophleum chlorostachys* woodland over mixed *Acacia*, *Grevillea*, *Hakea* spp. shrubland over *Triodia* spp. hummock grassland and *Aristida*, *Eriachne*, *Eragrostis* and *Sorghum* spp. tussock grassland. Landforms recorded across the Project Area broadly comprised sandy clay to light clay flats and gentle slopes (Ag, AgBc, AgCgEc, AtAcDo, BcCg, BcTc, CgAgBc), dune slopes, crests and swales (BcGaCg, CgCzBc, CzEcCg, EcCg) and open depressions and creekline communities (CbEc, EmEcAg).

A DBCA Threatened and Priority Communities database search (DBCA 2018c) identified three known occurrences of PECs within 50 km of the Project Area, none of which were inferred to represent any known or potential conservation significant communities listed under the EPBC Act, the BC Act or by DBCA. These findings are consistent with results from the desktop review undertaken for the Project Area, which included a review of Commonwealth and State database searches and previous relevant studies in the region (Section 4.1), with no TECs or PECs recorded or identified as likely to occur in the local region from this review.

The Kimberley Vegetation Association 760, listed as P1, is described as 'shrublands, pindan; *Acacia tumida* shrubland with scattered low bloodwood & *Eucalyptus setosa* (excluded name) over ribbon & curly spinifex' (DBCA 2021d). This PEC is restricted to two areas associated with the Fitzroy River and Lennard River systems, located approximately 28 km to the west and 70 km to the north of the Project Area (DBCA 2021c). Species assemblages associated with the Kimberley Vegetation Association 760 PEC, as described above, were not identified within any of the 13 vegetation associations delineated within the Project Area.

The Kimberley Vegetation Association 759 (listed as P3), described as 'grasslands, tall bunch grass savanna woodland, coolabah over ribbon/blue grass (*Bothriochloa* spp.; DBCA 2021d). This PEC is restricted to two small patches located 23 km to the south and 68 km north-northeast of the Project Area (DBCA 2021c). Species assemblages associated with the Kimberley Vegetation Association 759 PEC, as described above, were not identified within any of the 13 vegetation associations delineated within the Project Area.

The Leopold Land System (listed as P3), described as 'cracking clay plains and marginal outcrop alluvial plains, grasslands and very open grassy woodlands' (DBCA 2021d). One patch of this PEC is located approximately 49 km to the east of the Project Area (DBCA 2021c). Landforms associated with the

Leopold Land System PEC (i.e. cracking clay plains and marginal outcrop alluvial plains) were not identified within the Project Area.

Vegetation communities mapped within the Project Area align with Beard's vegetation association mapping, as presented in Section 2.1.4 above. Vegetation communities Ag, AgBc, AgCgEc, AtAcDo, BcCg, BcGaCg, BcTc, CgAgBc, CgCzBc, EcCg and EmEcAg broadly comprise aspects of Beard's North Fitzroy Plains 64 and 710 vegetation associations with the presence of mixed hummock (*Triodia* spp.) and tussock grasslands, *Adansonia gregorii*, *Bauhinia cunninghamii* and ribbon grass (*Chrysopogon fallax*; Government of Western Australia 2019). Vegetation communities AgCgEc, CbEc, BcTc, BcGaCg, EcCg, CzEcCg broadly comprise aspects of Beard's North Fitzroy Plains 699 and 700 vegetation communities with the presence of shrublands over curly spinifex (*Triodia bitextura*) on sandplain or between dunes (Government of Western Australia 2019).

Each of these vegetation associations has greater than 99% of their extent remaining within Western Australia (Government of Western Australia 2019) and are therefore not considered locally restricted.

Vegetation communities recorded within the Project Area are similar to those recorded from previous studies within the region; Low Ecological Services (2012b) recorded a mix of *Bauhinia cunninghamii*, *Adansonia gregorii*, *Corymbia* spp. and *Acacia* spp. over hummock (*Triodia* spp.) and tussock grasslands (*Aristida*, *Sorghum*) within the Asgard 2D seismic survey area, located adjacent to and within the current Project Area. Low Ecological Services (2020) also recorded similar plant community structure and composition, including low open woodlands (*Adansonia gregorii*, *Bauhinia cunninghamii*, *Corymbia* spp.) and grasslands, riparian communities and low woodland on sand dunes within the Odin 2D and 3D seismic survey area, located adjacent to and within the current Project Area. Woodman Environmental (2007) also recorded a plant community of similar composition (open woodland of *Eucalyptus* and *Corymbia* over *Aristida* and *Eriachne* tussock grasses) within their Valhalla Well Site survey area.

Vegetation condition within the Project Area ranged from Excellent to Poor, with majority of the vegetation within the Project Area classed as Very Good (69.93 ha; 54.57%) and Excellent (45.28 ha; 35.34%). Disturbances within the Project Area included impacts from pastoral activities (e.g. cattle grazing, scats and tracks), previous clearing and adjacent tracks which facilitate edge effects and minor weed invasion. The Project Area also has prevalence of fire with many areas being recently burnt across the landscape, particularly preceding the field survey in May.

5.2. Fauna

5.2.1. Fauna habitat

The Project Area contained three broad fauna habitat types, namely Fauna habitat 1: Mixed open woodland over grassland on sandy clay flats and slopes, which correlates to vegetation communities Ag, AgBc, AgCgEc, AtAcDo, BcCg, BcTc and CgAgBc, Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests, which correlates to vegetation communities BcGaCg, CgCzBc, CzEcCg and EcCg, and Fauna habitat 3: Eucalypt open woodland and mixed shrubland on closed depression and creekline, which correlates to vegetation communities CbEc and EmEcAg.

Fauna habitats within the Project Area broadly represent aspects of the Calwynyardah, Camelgooda and Djada Land Systems on which they occur, including the presence of woodlands and grasslands,

sandplains and sand dunes and floodplain supporting woodland and grasslands (DPIRD 2021a). These land systems are represented in the broader landscape and are not considered as locally restricted. Fauna habitats recorded within the Project Area are similar to those recorded from previous studies within the local area; Buru Energy and Outback Ecology (2014) recorded similar habitat types, including sand plains and dunes, alluvial channels and floodplains, located within their survey area (Ophir, Paradise, Valhalla, Eden and Ellendale) adjacent to the west of the Project Area, while ELA (2016) recorded a mixture of woodlands and grasslands on dunes and plains at their Valhalla Central A survey area, which is located within the adjacent to the Project Area.

5.2.2. Fauna overview

A total of 75 fauna species were recorded during the field survey. This number comprised of 52 birds, five mammals, eight reptiles and ten invertebrates. This is similar to other assemblages recorded in the local area, with Low Ecological Services (2020) recording a total of including 60 birds, 11 mammals, three amphibians and five reptile species within the Odin 2D and 3D seismic survey area, located adjacent to and within the current Project Area, and Buru Energy and Outback Ecology (2014) recording a total of 86 vertebrate fauna species including 72 birds, seven mammals, five reptiles and two amphibians within their survey area (Ophir, Paradise, Valhalla, Eden and Ellendale) adjacent to the west of the Project Area.

5.2.3. Conservation significant fauna

One fauna species of conservation significance was recorded within the Project Area; the Greater Bilby (*Macrotis lagotis*), listed as VU under the EPBC Act and BC Act. The Greater Bilby is a medium-sized burrowing marsupial of the Thylacomyidae family, with long, soft, blue-grey fur over most of the body and white to cream on the belly. It has large ears, a long-pointed snout and a black tail with a white tip (Threatened Species Scientific Committee [TSSC] 2016a). This species is currently known from 3303 records within Western Australia from the Dampier Peninsula in the north to Albany in the south (DBCA 2007-2021). The range of the Greater Bilby has, however, declined, with wild populations in Western Australia now reduced to the Gibson Desert, Little Sandy Desert, Great Sandy Desert and parts of the Pilbara and southern Kimberley (TSSC 2016a). The remaining populations of the Greater Bilby occupy three main habitats: open tussock grassland on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas (TSSC 2016a).

The Greater Bilby has been previously recorded in the local region, with unconfirmed signs recorded in both Low Ecological Services (2020) and Low Ecological Services (2012b). A previous record from 2002, identified from the DBCA Threatened and Priority fauna database search undertaken for the Project Area, is located approximately 47 km north of the Project Area (DBCA 2021b). Within the Project Area, evidence of this species in the form of diggings was recorded at four locations in the south-east within Fauna habitat 2. Greater Bilby diggings have a conical shape, which is a distinguishing feature of this species (Moseby *et al*. 2012, Department of Sustainability, Environment, Water, Population and Communities [SEWPaC] 2011). Diggings were relatively fresh and intact (i.e. had not completely collapsed or washed away) and estimated to be less than one year old. No direct observations of this species were made. Within the Project Area, Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests is considered as providing suitable habitat for this species.

Of the remaining 53 conservation listed fauna species identified from the pre-likelihood of occurrence survey assessment as possibly occurring within the Project Area, nine of these are considered as having

the potential to occur post-survey, based on proximity of previous records to the Project Area and availability of suitable habitat within the Project Area:

- *Erythrura gouldiae* (Gouldian Finch; listed as EN under the EPBC Act and as P4 by DBCA);
- *Falco hypoleucos* (Grey Falcon; listed as VU under the EPBC Act and BC Act);
- *Actitis hypoleucos* (Common Sandpiper; listed as M under EPBC Act and BC Act);
- *Apus pacificus* (Fork-tailed swift; listed as M under EPBC Act and BC Act);
- *Calidris acuminata* (Sharp-tailed sandpiper; listed as M under EPBC Act and BC Act);
- *Plegadis falcinellus* (Glossy ibis; listed as M under the EPBC Act and BC Act).
- *Falco peregrinus* (Peregrine falcon; listed as OS under BC Act);
- *Ctenotus uber johnstonii* (Spotted ctenotus (northeast); listed as P2 by DBCA); and
- *Leggadina lakedownensis* (Northern short-tailed mouse; listed as P4 by DBCA).

Of these, four species (*Actitis hypoleucos, Apus pacificus, Calidris acuminata* and *Plegadis falcinellus*) are migratory bird species which may utilise habitat within the Project Area only when conditions are favourable (e.g. after periods of heavy rainfall). Due to the vagrant and mobile nature of these species, their likelihood of occurrence rating (potential) is based on the availability of potentially suitable habitat within the Project Area and close proximity of recent records of these species (within 50 km).

The Gouldian Finch (*Erythrura gouldiae*) is a small bird, 12-15 cm in length, weighing about 14-15 grams. The adults are vividly multi-coloured, and exhibit three different facial colour-morphs: black-headed (most common), red-headed and yellow-headed (rare; TSSC 2016b). This species is currently known from 466 records within WA over a range of approximately 800 km, from Broome in the west to Kununurra in the east (DBCA 2007-2021). A recent record of this species from 2010 is located within 30 km of the Project Area (DBCA 2021b). Its preferred habitat consists of open woodlands that are dominated by Eucalypt trees and support a ground cover of *Sorghum* and other grasses (TSSC 2016a). Within the Project Area, Fauna habitat 1: Mixed open woodland over grassland on sandy clay flats and slopes and Fauna habitat 2: Mixed open woodland over tussock grasses on dune slopes and crests are considered as providing potentially suitable habitat for this species and it is therefore considered as having the potential to occur within the Project Area.

The Peregrine Falcon (*Falco peregrinus*) and the Grey Falcon (*Falco hypoleucos*) are large, powerfully build raptors (Birdlife Australia 2021) that are considered as having the potential to occur within the Project Area due to their ranges and habitat requirements. These species have wide ranges, with records occurring across most bioregions of Western Australia from the South-west to the Kimberley region (DBCA 2007-2020). Habitat requirements for each of these species are broad and varied, some of which are met by all fauna habitats within the Project Area in the form of plains, grasslands and shrublands. Previous records of these species are located within 20 km (*Falco peregrinus*) and 55 km (*Falco hypoleucos*) of the Project Area (DBCA 2021b).

The Spotted Ctenotus (northeast; *Ctenotus uber johnstonii*) is a medium sized long tailed skink (to 24 cm long) with a pattern of stripes and spots, differentiated from *C. uber* by the presence of a well-developed vertebral stripe and contiguous nasal scales (Wilson and Swan 2010; Storr *et. al* 1999). The subspecies is known from 44 records within Western Australia, from near Derby in the north to south of Port Hedland in the south (DBCA 2007-2021). It has been recorded occurring in the arid northeast interior on hard, reddish soils (Storr *et. al* 1999). Due to the presence of potentially suitable habitat (hard

reddish soils of Fauna habitat 1) and the close proximity of two previous recent records to the Project Area (within 15 km from 2011; DBCA 2021b), this species is considered as having the potential to occur.

The Northern Short-tailed Mouse (*Leggadina lakedownensis*) is a small, nocturnal rodent endemic to northern Australia, occurring from the Pilbara region of Western Australia to Cape York in the east (Aplin *et al*. 2016). It occupies monsoonal tropical coast to semiarid areas in spinifex and tussock grasslands, samphire, sedgelands, *Acacia* shrublands, tropical *Eucalyptus* and *Melaleuca* woodlands and stony ranges (Van Dyck *et al.* 2003). Two recent records of this species from 2011 are located within 15 km of the Project Area (DBCA 2021b). Given the suitability of available habitat(spinifex and tussock grasslands, *Acacia* woodlands) and the presence of nearby records of this species, it is considered as having the potential to occur within the Project Area.

Of note, Low Ecological Services (2020) recorded unconfirmed signs (native mammal scats) of the Northern Quoll (*Dasyurus hallucatus*). Given the absence of species habitat requirements (rocky areas, Eucalypt forests etc.) and no previous records within 100 km of the Project Area (DBCA 2021b), this species is considered as unlikely to occur within the Project Area.

Several fauna species previously recorded in the vicinity of the Project Area as conservation significant species are no longer listed as such. These include *Ardea modesta* (Eastern Great Egret; Buru Energy and Outback Ecology 2014), *Ardeotis australis* (Australian Bustard; Buru Energy and Outback Ecology 2014; Low Ecological Services 2012b; Low Ecological Services 2011b), *Burhinus grallarius* (Bush Stone-curlew; Buru Energy and Outback Ecology 2014), and *Merops ornatus* (Rainbow Bee-eater; ELA 2016; Buru Energy and Outback Ecology 2014; Low Ecological Services 2012b; Low Ecological Services 2011a).

5.3. Aboriginal significant bush foods[2]

5.3.1. Aboriginal significant bush foods – flora

A total of two flora species considered as Aboriginal significant bush foods were recorded within the Project Area, namely *Adansonia gregorii* (Boab) and *Carissa lanceolata* (Conkerberry).

Boab trees (Aboriginal name: jumuluny) are a Kimberley icon, growing right across from the west coast of the Kimberley to the east, into the Northern Territory. Boabs range from 10-15 m in height and 9-12 m in width and have bright lime to dark green leaves shaped like a star (DBCA and WAH 2021). The boab tree produces a hard pod with light brown fur that grows on the outside. The hard pod is broken to reveal a fruit; a white, powdery pith containing 10 to 20 or more seeds. The powdery pith inside the nut, along with the seeds, is what can be eaten and has a sherbet texture and a sour, tangy flavour. The pith is commonly crushed and mixed with water and sugarbag droplets and then eaten. The seeds found inside the pith can be dried and eaten like peanuts. The boab also has other traditional uses, including the use of the bark to make strong, thick twine, the trunk to produce water and the fruit for medicinal or artistic purposes.

Within the Project Area, boab trees were recorded as a dominant or associated species within five of the 14 vegetation communities described, at a <5% cover. Of note was one particularly large tree occurring across a portion of the track leading to the Midgard well site (m 685634E; m 7992864N).

The conkerberry (Aboriginal name: piriyalji) is native mainly to the Top End and central Australia but is also found around Cape York in far north Queensland and in the Kimberley region of Western Australia. In a hot, dry climate this species grows on a wide range of terrains and soil types. The Conkerberry is a multi-stemmed shrub, 1-3 m high with glossy green narrow leaves, hard thorns, and white, star-shaped flowers from December to January. The small conkerberries, also known as bush currants, are 1-2 cm long and appear in February to March, turning a dark purple or black when ripe. Aboriginal people frequently eat conkerberries, as they have a sweet, refreshing taste. The conkerberry has other traditional uses, including burning of the wood to create smoke to treat colds and coughs (inhalation), the orange roots to burn to keep bad spirits away or as an insect deterrent.

Within the Project Area, conkerberry was recorded as a dominant or associated species within ten of the 14 vegetation communities described, at a <5% cover.

5.3.2. Aboriginal significant bush foods – fauna

A total of four fauna species considered as Aboriginal significant bush foods were recorded within the Project Area, namely *Ardeotis australis* (Australian Bustard), *Osphranter rufus* (Red Kangaroo), *Varanus gouldii* (Sand Goanna) and *V. panoptes* (Yellow-spotted Monitor).

Australian Bustard (Aboriginal name: wawun, kere artewe, kipara, danimila), also known as 'bush turkey' to Aboriginal people, are large ground birds that roam the grasslands, woodlands and open plains, mainly across the northern and central parts of Australia where the climate is warm and dry. They can grow to 1.5 m with a wingspan of 2.5 m, and the average male can weight 6.5 kilograms (kg). Australian

[2] Aboriginal significant bush food species information is sourced from Martin (2014) and Low (1991)

Bustard has played an important role in the diet of Indigenous people throughout the Kimberley, central desert and for North Queensland, and is still eaten today. This species also plays an important part in the dreamtime stories, with many Indigenous people having totemic spiritual connections with the animal. Australian Bustard was recorded from one location within the Project Area (m 683743E; m 7992977 N), however is likely to utilise most habitats found throughout the Project Area as they wander and search for food.

Kangaroos (Aboriginal name: ganuurr, kere aherre, malu, jarlangarnany, gangurru) are herbivorous marsupials with large, powerful hindlegs, large feet for leaping and a long, muscular tail for balance. They can be found across most of Australia occurring across a wide and varying range of habitat types. There are four species of kangaroo; Red, Eastern Grey, Western Grey and Antilopine. The Red Kangaroo is the largest of the four species, with males growing to 2 m and weighing up to 100 kg. In addition to being hunted for food, kangaroos play an important part in dreamtime stories of many Aboriginal language groups and has spiritual totemic significance for some tribes. Red Kangaroo (*Osphranter rufus*) was recorded from scats throughout the Project Area and spotted in the distance at various locations and is likely to utilise most habitats found throughout the Project Area.

Goannas (Aboriginal name: karda, ganyal, kanyarrany) are large, carnivorous lizards with sharp teeth and claws, growing to 2-3 m long. There are 30 species of goanna in the world, 25 of which can be found within Australia, generally in warmer climates. Goannas typically reside underground in burrows or hollow logs and typically prey on birds, bird eggs, or smaller mammals. Goanna is considered a delicacy amongst Aboriginal people, and to hunt a goanna takes a lot of skill and energy; it involves tracking the goanna to find its burrow and then flushing it out to catch it. Goannas also feature strongly in dreamtime stories and as individual, family and clan spiritual totems. During the field survey, both *Varanus gouldii* (Sand Goanna) and *V. panoptes* (Yellow-spotted Monitor) were spotted several times sunbaking along tracks. These species are likely to utilise all habitats found throughout the Project Area for foraging and/or burrowing.

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Appendix A Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CR)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (M)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australian and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Specially protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threatened species (T)
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Critically Endangered species	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
Endangered species	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.

Category	Code	Description
Vulnerable species	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.
Extinct in the wild species	EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

Categories are detailed below.

Category	Code	Description
Migratory species	M	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Priority species (P)

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Definition
Priority 1	P1	*Poorly-known species* Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	*Poorly-known species* Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	*Poorly-known species* Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	P4	*Rare, Near Threatened and other species in need of monitoring* (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B Likelihood of occurrence assessment criteria

Likelihood rating	Criteria
Recorded	The species has previously been recorded within project area from DBCA database search results and/or from previous surveys of the project area, and/or the species has been confirmed through a current vouchered specimen at WA Herbarium.
Likely	The species has not previously been recorded from within the project area. However, (to qualify requires one or more criteria to be met): • the species has been recorded in close proximity to the project area, and occurs in similar habitat to that which occurs within the project area • core habitat and suitable landforms for the species occurs within the project area either year-round or seasonally. In relation to fauna species, this could be that a host plant is seasonally present on site, or habitat features such as caves are present that may be used during particular times during its life cycle e.g. for breeding. In relation to both flora and fauna species, it may be there are seasonal wetlands present • there is a medium to high probability that a species uses the project area.
Potential	The species has not previously been recorded from within the project area. However, (one or more criteria requires to be met): • targeted surveys may locate the species based on records occurring in proximity to the project area and suitable habitat occurring in the project area • the project area has been assessed as having potentially suitable habitat through habitat modelling • the species is known to be cryptic and may not have been detected despite extensive surveys • the species is highly mobile and has an extensive foraging range so may not have been detected during previous surveys The species has been recorded in the project area by a previous consultant survey or there is historic evidence of species occurrence within the project area. However, (one or more criteria requires to be met): • doubt remains over taxonomic identification, or the majority of habitat does not appear suitable (although presence cannot be ruled out due to factors such as species ecology or distribution) • coordinates are doubtful.
Unlikely	The species has been recorded locally through DBCA database searches. However, it has not been recorded within the project area and • it is unlikely to occur due to the site lacking critical habitat, having at best marginally suitable habitat, and/or being severely degraded • it is unlikely to occur due to few historic record/s and no other current collections in the local area. The species has been recorded within the bioregion based on literature review but has not been recorded locally or within the project area through DBCA database searches. The species has not been recorded in the project area despite adequate survey efforts, such as a standardised methodology or targeted searching within potentially suitable habitat.

Likelihood rating	Criteria
Does not occur (one or more criteria requires to be met).	The species is not known to occur within the IBRA bioregion based on current literature and distribution. The conspicuous species has not been recorded in the project area despite adequate survey efforts at an appropriate time of year to detect the species within potentially suitable habitat. The project area lacks important habitat for a species that has highly selective habitat requirements. The species has been historically recorded within project area or locally; however, it is considered locally extinct due to significant habitat changes such as land clearing and/or introduced predators.

Appendix C Flora likelihood of occurrence assessment

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Aristida polyclados	-	P1	DBCA 2021a	Tufted annual, grass-like or herb, 0.3-0.4 m high. Fl. brown, Apr.	Alluvium. Limestone gorges.	Unlikely	Nearest record (1988) ~20 km N of Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. alluvial soils in limestone gorges. Known records are sparse being associated with gorges, with the nearest record approximately 20 km from the Project Area.
Corymbia pedimontana	-	P1	DBCA 2021a	Tree, to 10 m high, bark brownish-red, tessellated. Fl. Jun or Sep	Red sandy soils or red loam over limestone. Plains at base of hills.	Unlikely	Nearest records (1988) ~60 km NE of the Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. sandy soils over limestone at the base of hills. Known records occur in a distinct cluster approximately 60 km northeast of the Project Area
Cucumis sp. Bastion Range (A.A. Mitchell et al. AAM 10710)	-	P1	DBCA 2021a	Climbing woody herb (vine), 0.5 m high	Previous records are from margins of creek in sandstone country, foot slopes. Brown silty loam over dolerite. Sandstone / limestone.	Unlikely	Nearest record (1962) ~75 km E of the Project Area. Little suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. creek margins within sandstone and limestone foot slopes. Known records all occur to the north and northeast of the Project Area, with the closest being 75 km away.
Cullen candidum	-	P1	DBCA 2021a	Shrub, to 3 m high. Fl. white, Sep to Oct.	Previous records are from brown clayey sand, floodplain.	Unlikely	Nearest populations (1988) ~55 km E of the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. floodplains with brown clayey sand. Known records are sparse, tending to occur to the east of the Project Area, the nearest being approximately 55 km away
Eucalyptus distans	-	P1	DBCA 2021a	Tree, to 9 m high, bark fine, grey, fissured	Loam, sandstone. Base of range.	Unlikely	Nearest record (1981) is ~50 km NW of the Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. sandstone at the base of ranges. Known records are very sparse, with majority occurring well to the north and northeast of the Project Area (>500 km). One record occurs approximately 40 km north of the Project Area, however this record is associated with rehabilitation trial at the Ellendale diamond mine.

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Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Fimbristylis dictyocolea	-	P1	DBCA 2021a	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5-0.8 m high	Edge of swamps or in water, sand over clay.	Potential	Nearest record (2014, in rehab) ~40 km N of the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area. Although standing water was present at the time of survey, this was result of sheet flow saturation, rather than presence of true swamp environments. The majority of known records occur near Katherine (Northern Territory), with a single record in Western Australia (collection date 1981), occurring approximately 50 km to the north of the Project Area
Fimbristylis sp. H Kimberley Flora (Carr 3944 & Beauglehole 47722)	-	P1	DBCA 2021a	Perennial, grass-like or herb (sedge), ca 0.3 m high. Fl. brown, Jul.	Occurs on sandy loam plains with meandering sandy drainage lines and brown sand soil.	Unlikely	Nearest record (1974) ~65 km NE of the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. sandy drainage lines. One known record of the species occurs at Tunnel Creek in the Napier Range (collection date 1974), approximately 65 km northeast of the Project Area.
Heliotropium foveolatum	-	P1	DBCA 2021a	Ascending to spreading annual, herb, to 0.3 m high. Fl. Feb to Jul.	Seasonally inundated, orange sandy clay on plains in low open *Bauhinia* woodland or *Triodia* grassland.	Potential	Nearest record (1 plant, 2011) ~20 km W of Project Area.	Potential	Suitable habitat and associated species occur within the Project Area, e.g. seasonally inundated, orange sandy clay on plains in low open *Bauhinia* woodland or *Triodia* grassland. A cluster of known records occur approximately 20 km west of the Project Area.
Heliotropium geocharis	-	P1	DBCA 2021a	Erect annual, herb, to 0.5 m high. Fl. white, Jan to Apr.	Alluvium, black soils. Plains.	Unlikely	Nearest record (1952) ~20 km W of the Project Area. Most recent nearby record (1988) ~60 km E of Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. black alluvial soils. Known records are sparse, with the nearest being approximately 20 km west of the Project Area (it is noted that record has a collection date of 1953)

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Heliotropium parviantrum	-	P1	DBCA 2021a	Erect annual, herb, to 0.15 m high. Fl. Feb to Jun.	Sandy soils. Flats, plains, rocky slopes.	Unlikely	Nearest record (1967) ~60 km NW of Project Area.	Unlikely	Marginal habitat may occur within the Project Area e.g. sandy soils on flats and plains. However, this assessment is based on very broad habitat descriptions (e.g. sandy soil), which do not contain sufficient detail. Known records are sparse, mostly occurring near Port Hedland. One record occurs approximately 60 km northwest of the Project Area (collection date 1967).
Mitrasacme sp. I Kimberley Flora (K.F. Kenneally s.n. PERTH 04115058)	-	P1	DBCA 2021a	Herb	In black soil of boggy soak with *Pandanus*.	Unlikely	Nearest record (1976) ~60 km NE of the Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. black soil of soggy soak. One record occurs at Little Spring, Leopold Downs, approximately 60 km NE of the Project Area
Nymphaea carpentariae	-	P1	DBCA 2021a	Aquatic plant with floating leaves	Ephemeral - semi - permanent floodplain pool on alluvial and colluvial flat surrounded by landscape of gneiss and granite hills and domes.	Unlikely	Nearest population (2019) ~60 km NE of the Project Area. Little suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. permanent wetlands. Two sparse records occur in association with rangelands, the nearest being 60 km northeast of the Project Area
Nymphaea kimberleyensis	-	P1	DBCA 2021a	Aquatic plant with floating leaves, gigantea-type; flowers blue.	Permanently inundated water bodies.	Unlikely	Nearest records (1998-2002) ~ km E of the Project Area. Little suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. permanently inundated water bodies. Known records form a cluster north of Fitzroy Crossing, approximately 60 km east of the Project Area.
Trachymene oleracea subsp. *sedimen*ta	-	P1	DBCA 2021a	Annual, herb, 0.3-0.6 m high, Fl. white/blue, May to Jun.	Limestone or sandstone rocky slopes.	Unlikely	Nearest record (1971) ~70 km NE of the Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. limestone or sandstone rocky slopes. Known records are very sparse, mostly occurring >500 km northeast of Project Area. One record occurs approximately 70 km northeast of the Project Area within the Napier Range.

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Trianthema kimberleyi	-	P1	Low Ecological Services 2012b	Prostrate, much-branched annual, herb. Fl. white-pink, Mar.	Schistous soils	Potential	Nearest record (1989) ~200 km SE of the Project Area. However, Low Ecological Services (2012b) shows a record of this species along Noonkanbah Rd <10 km from the Project Area. Suitable habitat may occur in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. schistous soils. Although a previous consultant survey recorded this species <10 km from the Project Area, known information suggests that this species occurs only on schistous soils, a soil type that was not recorded within the Project Area. The single known WAH record of this species occurs >200 km to the southeast of the Project Area.
Triodia pascoeana	-	P1	DBCA 2021a	Dense, tussock-forming perennial, grass-like or herb, 1-3 m high, non-resinous, Fl. Jan to Apr	Limestone. Limestone ranges & gorges, floodplains.	Unlikely	Nearest record (1988) is ~20 km N of the Project Area. Most recent record (2017) ~50 km NE of the Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. limestone soils and landscapes. Known records are sparse, with the nearest occurring approximately 50 km NE of the Project Area within the Napier Range
Cayratia cardiophylla	-	P2	DBCA 2021a	Deciduous climber. Fl. green-white, Aug to Dec.	Limestone. Seepage areas, amongst rocks.	Unlikely	Nearest records (1990) ~70 km E of Project Area. No suitable habitat in Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. limestone seepage areas amongst rocks. Known records are sparse, with the nearest occurring approximately 50 km NE of the Project Area within the Napier Range
Goodenia virgata	-	P2	Low Ecological Services 2012b	Ascending to erect, virgate perennial, herb, to 0.4 m high. Fl. yellow, Jul.	Red sandy loam. Near salt pans.	Potential	Nearest record (2000) ~400 km SE of the Project Area. However, Low Ecological Serviced 2012b shows a nearby record of this species within ~20 km of the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. red sandy loam near salt pans. Although a previous consultant survey recorded this species 5 km from the Project Area, known information suggests that this species occurs near salt lakes, a habitat type not found within the Project Area. WAH records all occur well to the south and southeast (>400 km) associated with inland saltpans.

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Hibiscus calcicola	-	P2	DBCA 2021a	Shrub, to 1.5 m high.	Red clay soils on limestone. At bases of rocky outcrops.	Unlikely	Nearest record (1981) ~70 km NE of the Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. red clay soils at the bases of rocky limestone outcrops. One known record occurs approximately 70 km northeast of the Project Area in the Geikie Gorge NP.
Pterocaulon globuliflorum	-	P2	DBCA 2021a	Erect, much-branched perennial, herb or shrub, 0.4-0.6 m high. Fl. white-cream, Jun.	Sand. Sandstone cliffs & scree slopes.	Unlikely	Nearest records (1974) ~70 km NE of the Project Area. Little suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. sandstone cliffs and scree slopes. One record occurs approximately 70 km northeast of the Project Area, within the Windjana Gorge National Park.
Acacia monticola x *tumida* var. *kulparn*	-	P3	DBCA 2021a	Shrub to 2 m, bark grey and fissured on branches	Red sand/loam/rocky, sand.	Unlikely	Nearest record (1983) is ~60 km N of the Project Area.	Potential	Marginal habitat may occur within the Project Area e.g. red sand/loam. This species is known to occur with *Acacia tumida*, a common species within the Project Area. Known records are geographically separated as to those occurring east of Derby and those occurring along the coast. The nearest record to the Project Area occurs approximately 60 km to the north. It is noted that collection records of this species are under a Temporary Sorting Slip at the WAH, until species nomenclature is resolved.
Corchorus fitzroyensis	-	P3	DBCA 2021a	Low compact bushy shrub to 0.3 m high, spreading to 1 m, flowers golden yellow	Alluvial and colluvial flats. Red-brown sandy clay loam.	Potential	Several records (1988) ~20 km SE of the Project Area.	Potential	Suitable habitat occurs within the Project Area, e.g. alluvial and colluvial flats with red-brown sandy clay loam. Several known records occur approximately 20 km south east of the Project Area.

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Fimbristylis sieberiana	-	P3	DBCA 2021a	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25-0.6 m high. Fl. brown, May to Jun.	Mud, skeletal soil pockets. Pool edges, sandstone cliffs. Riparian zones of permanent wetlands with high soil moisture maintained by groundwater flows (Pilbara). .	Unlikely	Nearest record (1988) ~60 km E of the Project Area. No suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. pool edges and sandstone cliffs. Known occurrences are scattered throughout the Kimberley and Pilbara, in association with gorges and permanent water pools. The nearest record occurs approximately 60 km east of the survey, within the Brooking Gorge Conservation Park.
Gomphrena leptophylla	-	P3	DBCA 2021a	Prostrate or erect to spreading annual, herb, to 0.15 m high. Fl. white, Mar to Sep.	Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	Unlikely	Nearest record (1972) ~60 km SW of the Project Area. Little suitable habitat in the Project Area.	Unlikely	Marginal habitat may occur within the Project Area e.g. sand, sandy to clayey loam. This species occurs across a range of different habitat types, with typical associated species not occurring within the Project Area (e.g. *Acacia bivenosa*, *Triodia epactia*, *Triodia lanigera*). Known records tend to occur within the Pilbara region, with only two records in the Kimberly region. The nearest record occurs approximately 60 km southwest of the Project Area (collection date 1972).
Goodenia byrnesii	-	P3	DBCA 2021a, Woodman Environmental Consulting 2007, Naturemap	Prostrate to decumbent herb, stems to 30 cm. Fl. yellow, Jan to Feb.	Sand. Edge of creek.	Likely	Nearest previous record (2007) ~700 m from the Project Area.	Likely	Suitable habitat and associated species occur within the Project Area, e.g. sandy creek edges with *Bauhinia cunninghamii* scattered low trees and grasses. Known records occur <1 km from the Project Area.
Goodenia sepalosa var. *glandulosa*	-	P3	DBCA 2021a, Woodman Environmental Consulting 2007	Prostrate to sprawling herb, 0.03-0.3 m high. Fl. yellow, Jan to Dec (mainly Apr-Jul).	Found in open woodland on red sand or loam. Midslope, very gentle.	Potential	Record of 1 plant (2011) ~13 km W of Project Area.	Likely	Suitable habitat and associated species occur within the Project Area, e.g. red sand or loams with *Bauhinia cunninghamii* open woodland over *Acacia tumida* var. *tumida* tall shrubland. A known record occurs <15 km from the Project Area.

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Nymphoides beaglensis	-	P3	DBCA 2021a, Naturemap	Aquatic annual, herb. Fl. white/white-pink-purple, Mar to Jun.	In shallow freshwater. Edges of permanent waterholes or in seasonally inundated claypans & depressions.	Potential	Nearest record is 2 plants (1997) ~40 km N of Project Area.	Recorded	Species was recorded in a seasonally inundated depression within the Project Area from eight point-locations totalling 112 individuals.
Phyllanthus fuernrohrii	-	P3	DBCA 2021a	Low shrub to 1 m high, flowers green	While reasonably widespread in the Northern Territory, South Australia, Queensland and New South Wales, in Western Australia it is only known from a single collection in the Wingellina Hills.	Does not occur	Does not occur in most of WA except near the SA border - misidentified previously and should be *P. hamelinii* (Barrett and Telford 2015)	Does not occur	Does not occur within the Project Area. This name has previously been misapplied in Western Australia to specimens here recognised as *P. hamelinii.*
Pterocaulon xenicum	-	P3	DBCA 2021a	Perennial herb, to 0.5 m tall	Rocky or gravelly plains and slopes in *Acacia* shrubland over *Triodia* grassland	Unlikely	Nearest record (1952) ~80 km SE of the Project Area. Little suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. rocky or gravelly plains and slopes. Known records are scattered, with the majority occurring well to the south of the Project Area. The nearest record occurs approximately 80 km to the southeast of the Project Area associated with limestone outcropping.
Schoenus punctatus	-	P3	DBCA 2021a	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), ca 0.6 m high. Fl. brown, Aug.	Sand along watercourses in open eucalypt woodland.	Unlikely	Nearest record (2004) ~75 km E of the Project Area.	Unlikely	Marginal habitat may occur within the Project Area e.g. sand along watercourses in open eucalypt woodland. Known records are very sparse, with the majority occurring well to the northeast of the Project Area. The nearest record occurs approximately 75 km northeast of the Project Area

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Tephrosia pedleyi	-	P3	DBCA 2021a	Prostrate, spreading or scrambling, shrub, spindly shrub (broom-like) or herb, flowers in June, July and August	Pindan sandplain, gently undulating sandplain. Very sparse open woodland.	Unlikely	Nearest record (1959) is ~75 km W of the Project Area.	Potential	Suitable habitat occurs within the Project Area, e.g. Pindan sandplain, very sparse open woodland. Known records are scattered to the south of the Project Area, the nearest being approximately 75 km to the southwest.
Tephrosia rosea var. Napier Range (C.R. Dunlop 7760 & B.K. Simon)	-	P3	DBCA 2021a	Erect, shrub, spindly shrub (broom-like) or herb, flowers in April.	Gritty, red clay soils, skeletal soils and between rock cracks, on plains and lower slopes of valleys. Eucalypt woodland over *Triodia* grassland.	Unlikely	Nearest records (1988, 1999) ~60 km NE of the Project Area. Little suitable habitat in the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. gritty skeletal soils and slopes of valleys. Known records are scattered to the north and east of the Project Area, the nearest being approximately 60 km north east within the Devonian Reef Conservation Park.
Tephrosia sp. Mistake Creek (A.C. Beauglehole 54424)	-	P3	DBCA 2021a	Erect, shrub, spindly shrub (broom-like), flowers in May, July and November	Alluvial flats and in rocky stream beds; recorded as occurring in woodland of *Gyrocarpus*, *Terminalia* and *Bauhinia.*	Unlikely	Nearest record (2006) ~70 km NE of the Project Area.	Unlikely	Suitable habitat does not occur within the Project Area e.g. alluvial flats and rocky stream beds (limestone). Known records are scattered to the north and northeast of the Project Area, with the majority occurring >400 km away near Lake Argyle and Purnululu National Park. The nearest records occur approximately 70 km northeast of the Project Area, in a small cluster within the Napier Range associated with limestone outcrops.

Taxon	Conservation status		Source	Species Information*	Habitat information*	Pre-survey Likelihood	Pre-survey likelihood justification^	Post-survey likelihood	Post-survey likelihood justification
	EPBC Act	BC Act / DBCA							
Triodia acutispicula	-	P3	Woodman Environmental Consulting 2007	Tussock-forming resinonus perennial, grass-like or herb, 0.5-1.5 m high. Fl. cream-brown, Jan to Apr.	Sandy soils. River levees, pindan plains, rocky hillslopes & outcrops.	Potential	Nearest record (2010) ~200 km NE of the Project Area. However, Woodman Environmental Consulting 2007 shows a record of this species along Noonkanbah Rd <5 km from the Project Area. Suitable habitat may occur in the Project Area.	Unlikely	Marginal habitat may occur within the Project Area e.g. Pindan plains; however, the species tends to mostly occur on river levees and rocky hillslopes and outcrops. Although Woodman Environmental Consulting 2007 recorded this species <5 km from the Project Area, known information shows that the majority of populations occur well to the north of the Project Area (>300 km). The nearest record (DBCA and WAH 2021) occurs >200 km to the north east at Mornington Camp.
Utricularia muelleri	-	P3	DBCA 2021a, Naturemap	Floating aquatic perennial, herb. Fl. yellow-white, May to Jun.	Seasonal swamps.	Potential	Nearest record of a population (1997) ~40 km NW of Project Area.	Unlikely	Suitable habitat does not occur within the Project Area. Although standing water was present at the time of survey, this was result of sheet flow saturation, rather than presence of true swamp environments. The majority of known records occur well to the north of the Project Area, the nearest being approximately 40 km northeast within Lanlacatta Swamp.

*Species information available from DBCA and WAH 2021

^Species location information from DBCA 2021a

Appendix D Fauna likelihood of occurrence assessment

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Calidris ferruginea	Curlew sandpiper	CR, IA	CR, IA	DBCA 2021a, PMST	Intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No suitable habitat for this species is present within the Project Area. A nearby record (2003) is located approximately 15 km to the west-southwest of the Project Area and is associated with the Fitzroy River.
Numenius madagascariensis	Eastern Curlew	CR, IA	CR, IA	PMST	Sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area.
Pezoporus occidentalis	Night Parrot	EN	CR	Unlikely	*Triodia* (Spinifex) grasslands and/or chenopod shrublands in the arid and semi-arid zones, and *Astrebla* spp. (Mitchell grass), shrubby samphire and chenopod associations, scattered trees and shrubs, *Acacia aneura* (Mulga) woodland, treeless areas and bare gibber.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	The closest confirmed record is over 400 km south-east of the Project Area.
Malurus coronatus coronatus	Purple-crowned fairy-wren (western)	EN	EN	DBCA 2021a, PMST	Dense, riparian vegetation in the wet-dry tropics of Western Australia and the Northern Territory. It is found near permanent rivers and springs (or associated billabongs and swamps), where it occupies dense thickets of Pandanus aquaticus or canegrass and also occurs, less frequently, in rushes and shrubs.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Several historical records (1920 - 2000) 25 km east of the Project Area.

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Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Rostratula australis	Australian Painted Snipe	EN	EN	PMST	Inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area.
Erythrura gouldiae	Gouldian finch	EN	P4	DBCA 2021a, Naturemap, PMST	Feed on grass seeds, presence of *Sorghum plumosum, Chrysopogon fallax, Triodia schinzii, Sehima nervosum.*	Potential	Suitable habitat may be present for this species within the Project Area.	Potential	Potentially suitable habitat is present within the Project Area. Closest record is 30 km south of the Project Area from 2010.
Petrogale lateralis subsp. (West Kimberley)	West Kimberley black-footed rock-wallaby	VU	EN	DBCA 2021a, PMST	This species is known to occur on only a small number of scattered ranges and rocky outcrops in the West Kimberley. Species is likely to require woodlands dominated by *Eucalyptus* and *Corymbia* species with old and dead trees that have suitable nesting hollows	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Three historical records (1901 and 1992) occur 30 km west of the Project Area.
Falco hypoleucos	Grey falcon	VU	VU	DBCA 2021a, PMST	It prefers timbered lowland plains (especially those that are acacia-dominated) which are interspersed with tree-lined watercourses. The majority of its habitat has an average rainfall of less than 500 mm but frequents other habitats including grassland and sand dune habitats.	Potential	Suitable habitat may be present for this species within the Project Area.	Potential	Marginally suitable habitat for this species occurs within the Project Area. Only one record 50 km south of the Project Area from 2002.
Macroderma gigas	Ghost bat	VU	VU	DBCA 2021a, PMST	Shrubland, rocky areas (eg. inland cliffs, mountain peaks), Forest, Caves and Subterranean Habitats (non-aquatic), Savanna.	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Most recent record (2006) is 50 km north-east of the Project Area.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Macrotis lagotis	Bilby, dalgyte, ninu	VU	VU	DBCA 2021a, PMST	The remaining populations of the greater bilby occupy three main habitats: open tussock grassland on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas.	Likely	Suitable habitat may be present for this species within the Project Area. Nearby recent records located within 50 km of the Project Area.	Recorded	Diggings were recorded within the Project Area
Pristis pristis	Freshwater sawfish	VU	P3	DBCA 2021a, Naturemap, PMST	They inhabit the sandy or muddy bottoms of shallow coastal waters, estuaries and river mouths, as well as the central and upper reaches of freshwater rivers and isolated water holes, with records of large tooth sawfish up to 400 km inland	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Records are confined to the Fitzroy River.
Polytelis alexandrae	Princess Parrot, Alexandra's Parrot	VU	P4	PMST	Sand dunes and sand flats in the arid zone of western and central Australia. It occurs in open savanna woodlands and shrublands that usually consist of scattered stands of *Eucalyptus*, *Casuarina* or *Allocasuarina* trees; an understorey of shrubs such as *Acacia*, *Cassia*, *Eremophila*, *Grevillea*, *Hakea* and *Senna*; and a ground cover dominated by *Triodia* species. The species is usually recorded from shrubland in swales between sand dunes with sites having a variety of shrubs among scattered emergent trees and a groundcover of spinifex (*Triodia* sp.), and less often in woodland.	Unlikely	Project Area is at the northern extent of this species range, with most records confined to the Great Sandy Desert, Little Sandy Desert, Great Victoria Desert and Central Ranges bioregions. One historical record is located within 100 km of the Project Area.	Unlikely	Project Area is at the northern extent of this species range, with most records confined to the Great Sandy Desert, Little Sandy Desert, Great Victoria Desert and Central Ranges bioregions. One historical record is located within 100km of the Project Area.
Actitis hypoleucos	Common Sandpiper	IA	IA	DBCA 2021a, Naturemap	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Generally, the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots.	Potential	Suitable habitat may be present for this species within the Project Area.	Potential	Two records from 2009 occur 10 km north of the project area. Sections of the project area are likely to provide marginally suitable habitat seasonally and after major rainfall events.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Apus pacificus	Fork-tailed swift	IA	IA	DBCA 2021a, Naturemap	In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities.	Potential	Suitable habitat may be present for this species within the Project Area.	Potential	This species occurs across a variety of habitats. One record from 2010 occurs 15 km west of the project area.
Calidris acuminata	Sharp-tailed sandpiper	IA	IA	DBCA 2021a, Naturemap	They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water, or in short sparse vegetation, such as grass or saltmarsh.	Potential	Suitable habitat may be present for this species within the Project Area.	Potential	One record from 2009 occurs 10 km north of the project area. Sections of the project area are likely to provide marginally suitable habitat seasonally and after major rainfall events.
Calidris melanotos	Pectoral Sandpiper	IA	IA	PMST	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No suitable habitat for this species is present within the Project Area.
Calidris ruficollis	Red-necked stint	IA	IA	DBCA 2021a	In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No suitable habitat for this species is present within the Project Area. A nearby record (2003) is located approximately 15 km to the west-southwest of the Project Area and is associated with the Fitzroy River.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Calidris subminuta	Long-toed Stint	IA	IA	DBCA 2021a	The Long-toed Stint occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No suitable habitat for this species is present within the Project Area. A nearby record (2003) is located approximately 15 km to the west-southwest of the Project Area and is associated with the Fitzroy River.
Cecropis daurica	Red-rumped Swallow	IA	IA	PMST	This species is found in open hilly country and mountains, river gorges, valleys, sea cliffs, as well as in cultivated areas and human habitations, including towns.	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No suitable habitat for this species is present within the Project Area.
Charadrius veredus	Oriental plover	IA	IA	DBCA 2021a, Naturemap, PMST	Inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps, or open areas that have been recently burnt. At the onset of the Wet Season, some may move into lightly wooded grasslands.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	One record from 2010 occurs 20 km west of the Project Area. Sections of the project area may provide marginally suitable habitat seasonally and after major rainfall events, however majority of records of this species are confined to coastal areas.
Cuculus optatus	Oriental Cuckoo	IA	IA	PMST	Forest, Monsoon forests; wet sclerophyll forests; paperbark swamps; mangroves.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Gelochelidon nilotica	Gull-billed tern	IA	IA	DBCA 2021a	It breeds in a variety of locations with bare or sparsely vegetated islands, banks, flats, or spits of dry mud and sand including barrier beaches (shoals), dunes, saltmarshes, saltpans, freshwater lagoons, estuaries, deltas, inland lakes, rivers, marshes and swamps.	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Records are confined to the Fitzroy River.
Glareola maldivarum	Oriental pratincole	IA	IA	DBCA 2021a, Naturemap	Open plains, floodplains or short grassland (including farmland or airstrips), often with extensive bare areas. Terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins. The species also occurs along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Only one record 50 km west of the Project Area from 2003.
Hirundo rustica	Barn Swallow	IA	IA	PMST	In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area.
Hydroprogne caspia	Caspian Tern	IA	IA	DBCA 2021a, Naturemap	The Caspian Tern is mostly found in sheltered coastal embayment (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Records are over 40 km away from the Project Area.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Limicola falcinellus	Broad-billed sandpiper	IA	IA	DBCA 2021a	The Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby.	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Only one record 50km west of the Project Area from 1979.
Limosa limosa	Black-tailed godwit	IA	IA	DBCA 2021a	The bar-tailed godwit occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats.	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Only one record 10 km north of the Project Area associated with the Fitzroy River.
Motacilla cinerea	Grey Wagtail	IA	IA	PMST	Inhabits fast-flowing mountain streams and rivers with riffles and exposed rocks or shoals, often in forested areas. It is also found in more lowland watercourses where there are artificial waterfalls, weirs, millraces or lock gates.	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area.
Motacilla flava	Yellow Wagtail	IA	IA	PMST	Range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range it is also found in large forest clearings.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area.
Pandion cristatus	Osprey, eastern osprey	IA	IA	DBCA 2021a, PMST	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Records are over 50 km east and west of the Project Area associated with the Fitzroy River.

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Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Plegadis falcinellus	Glossy ibis	IA	IA	DBCA 2021a, Naturemap	The Glossy Ibis' preferred habitat for foraging and breeding are freshwater marshes at the edges of lakes and rivers, lagoons, floodplains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons.	Potential	Suitable habitat may be present for this species within the Project Area.	Potential	Several records surrounding the project area, with the closest occurring 10 km north. Marginal habitat for this species is present within the Project Area.
Pluvialis fulva	Pacific golden plover	IA	IA	DBCA 2021a, Naturemap	In Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks.	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Two historical records (1978 and 2003) occur over 50 km west and east of the Project Area.
Tringa glareola	Wood sandpiper	IA	IA	DBCA 2021a	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially *Melaleuca* and River Red Gums (*Eucalyptus camaldulensis*) and often with fallen timber.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Closest record is 10 km north of the Project Area associated with the Fitzroy River.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Tringa nebularia	Common greenshank	IA	IA	DBCA 2021a, Naturemap, PMST	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayment, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms	Unlikely	No suitable habitat for this species is present within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Several records 30 km west of the Project Area from 2010.
Tringa stagnatilis	Marsh sandpiper	IA	IA	DBCA 2021a, Naturemap, PMST	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Only one record 50 km west of the Project Area.
Mouldingia occidentalis	A camaenid land snail (eastern Napier Ranges)	-	CR	DBCA 2021a	No habitat information is available for this species	Unlikely	Records of this species are 60 km north-east of the Project Area. The most recent records are from 2014.	Unlikely	Records of this species are 60 km north-east of the Project Area. The most recent records are from 2014.
Trichosurus vulpecula arnhemensis (Kimberley)	Northern brushtail possum (Kimberley)	-	VU	DBCA 2021a, Naturemap	It occurs mainly in tall eucalypt open forests with large hollow-bearing trees, particularly where the understorey includes some shrubs that bear fleshy fruits. However, the subspecies also occurs in some mangrove communities (especially where these contain hollow bearing trees).	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Only one record 50 km east of the Project Area from 1965.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Westraltrachia alterna	A camaenid land snail (McSherry Gap and Cyclad Hill)	-	VU	DBCA 2021a	No habitat information is available for this species	Unlikely	Records of this species are 60 km north-east of the Project Area. The most recent records are from 2014.	Unlikely	Records of this species are 60 km north-east of the Project Area. The most recent records are from 2014.
Crocodylus johnstoni	Australian freshwater crocodile	-	OS	DBCA 2021a, Naturemap	Various permanent freshwater areas such as lakes, billabongs and swamps, plus less saline upstream areas of river systems and creeks. Marginal populations are found in upstream sandstone escarpment country. Generally, not found near the coast, where the high salinity and competition with the more dominant *C. porosus* makes the habitat far less favourable.	Unlikely	No suitable habitat for this species is present within the Project Area. Majority of nearby records are confined to the Fitzroy River.	Unlikely	No suitable habitat for this species is present within the Project Area. Majority of nearby records are confined to the Fitzroy River.
Falco peregrinus	Peregrine falcon	-	OS	DBCA 2021a, Naturemap	The Peregrine Falcon is found in most habitats, from rainforests to the arid zone, and at most altitudes, from the coast to alpine areas. It requires abundant prey and secure nest sites, and prefers coastal and inland cliffs or open woodlands near water, and may even be found nesting on high city buildings	Potential	Suitable habitat may be present for this species within the Project Area	Potential	This species occurs across a variety of habitats. Several records surround the project area.
Anilios micromma	Small-eyed blind snake (Leopold Downs)	-	P1	DBCA 2021a	Known from only one specimen, collected in 1924 at Leopold Downs Station in semi-arid sw. interior of the Kimberley, WA.	Unlikely	Species is known from two historical records (1900 and 1924) located 95 km east of the Project Area.	Unlikely	Species is known from two historical records (1900 and 1924) located 95 km east of the Project Area.
Anilios troglodytes	Sandamara blind snake (Napier Range)	-	P1	DBCA 2021a	Southern Kimberley, WA, from Napier Range to Kununurra. Tunnel Cave, Napier Range, Western Australia. No habitat information available.	Unlikely	Records of this species are historical (1975) and are located 85 km northeast of the Project Area.	Unlikely	Records of this species are historical (1975) and are located 85 km northeast of the Project Area.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Hannia greenwayi	Greenway's grunter	-	P1	DBCA 2021a, Naturemap	Freshwater streams.	Unlikely	Records are confined to the Fitzroy River.	Unlikely	Records are confined to the Fitzroy River. Creeklines are unlikely to remain inundated throughout the year and would be potentially unsuitable to support a population of this species within the Project Area.
Lerista robusta	Broad-eyed slider (Kimberley)	-	P1	DBCA 2021a	Arid grasslands south of St. George Ranges, southern interior of Kimberley. Known from one population.	Unlikely	Species is known from seven historical records (1989) located 75km south of the Project Area.	Unlikely	Species is known from seven historical records (1989) located 75km south of the Project Area.
Pilsbrycharopa tumida	A charopid land snail (Noonkanbah)	-	P1	DBCA 2021a	No habitat information is available for this species	Unlikely	One record of this species is 30km south of the Project Area in 1988.	Unlikely	One record of this species is 30km south of the Project Area in 1988.
Craterocephalus lentiginosus	Prince Regent hardyhead	-	P2	DBCA 2021a, Naturemap	Found only in the Kimberley region of north Western Australia. Freshwater streams, brackish water.	Potential	May occur within the Fitzroy River tributary occurring within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Records are confined to the Fitzroy River.
Vespadelus douglasorum	Yellow-lipped cave bat	-	P2	DBCA 2021a	Restricted to the Kimberley region and is widespread within this range. The areas in which they forage are streams running through tropical woodland, riparian zones dominated by pandanus and melaleuca trees within the 800 mm isohyet. They roost in limestone and sandstone caves in colonies.	Unlikely	Several historical records (1958 to 1982) 70 km east of the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Several historical records (1958 to 1982) 70 km east of the Project Area.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Westraltrachia lievreana	Le Lievre Ridge camaenid land snail	-	P2	DBCA 2021a	No habitat information is available for this species.	Unlikely	Nearby records are historical.	Unlikely	Two records of this species are 40 km north-east of the Project Area from 1976 and 1986.
Westraltrachia subtila	A camaenid land snail (Ninety Seven Mile Creek)	-	P2	DBCA 2021a	No habitat information is available for this species.	Unlikely	Nearby records are historical.	Unlikely	One record of this species is 60km north-east of the Project Area from 1977.
Ctenotus uber johnstonei	Spotted ctenotus (northeast)	-	P2	DBCA 2021a, Naturemap	The Ctenotus uber group is known to prefer the hard, reddish soils. This skink is known from the arid interior of Western Australia.	Potential	Suitable habitat may be present for this species within the Project Area.	Potential	Several records recorded 15 km west of the project area between 2009 and 2011 and suitable habitat present within the project area.
Petropseudes dahli	Rock ringtail possum, wogoit	-	P3	DBCA 2021a	Rock ringtail possums live in rocky, sandstone outcrops where they are sheltered during the day. At night they move out of their sheltered rock crevices to feed in the trees within the area, often traveling no further than 10 m from their dens. These rocky areas usually are surrounded by flatter, lowland areas. The rocky encampments have increased water holding potential and are sometimes flooded in areas.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Only one record 50 km north of the Project Area.
Rhinonicteris aurantia	Orange leaf-nosed bat	-	P4	DBCA 2021a	Tropical woodland to semi-arid grasslands. During the dry season it roosts in caves, sometimes in large numbers, and disperses in the wet, using other roosts. This species is very selective in choosing hot, humid roosting sites.	Unlikely	Nearby records of this species are historical (1965 to 1980), occurring 40 km north of the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Historical records (1965 to 1980) 40 km north of the Project Area.

Species	Common name	Conservation status		Source	Habitat information	Pre-survey Likelihood	Pre-survey likelihood justification	Post-survey likelihood	Post-survey likelihood justification
		EPBC Act	BC Act / DBCA						
Lagorchestes conspicillatus leichardti	Spectacled hare-wallaby (mainland)	-	P4	DBCA 2021a, Naturemap	Open forests, open woodland, tall shrublands, tussock grasslands and hummock grasslands.	Potential	Suitable habitat may be present for this species within the Project Area.	Unlikely	No habitat for this species is present within the Project Area. Closest record is 25 km east from 2011 and only moderately certain.
Leggadina lakedownensis	Northern short-tailed mouse, Lakeland Downs mouse, kerakenga	-	P4	DBCA 2021a, Naturemap	Northern Short-tailed Mice occupy a diverse range of environments from the monsoon tropical coast to semi-arid climates, including spinifex and tussock grasslands, samphire and sedgelands, *Acacia* shrub-lands, tropical *Eucalyptus* and *Melaleuca* woodlands and stony ranges. Most habitats, however, are seasonally inundated on red or white sandy-clay soils.	Potential	Suitable habitat may be present for this species within the Project Area	Potential	Two records recorded 15 km west of the project area in 2011 and suitable habitat present.

Appendix E Flora species by site matrix

Quadrats 1-32

Family	Species	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06	ELA07	ELA08	ELA09	ELA10	ELA11	ELA12	ELA13	ELA14	ELA15	ELA16	ELA17	ELA18	ELA19	ELA20	ELA21	ELA22	ELA23	ELA24	ELA25	ELA26	ELA27	ELA28	ELA29	ELA30	ELA31	ELA32
Acanthaceae	*Rostellularia adscendens* var. *clementii*										X	X	X																				
Aizoaceae	**Trianthema pilosum*															X												X					
Aizoaceae	*Trianthema oxycalyptrum* var. *oxycalyptrum*																																
Amaranthaceae	*Achyranthes aspera*																																
Amaranthaceae	*Alternanthera angustifolia*							X													X												
Amaranthaceae	*Alternanthera nana*							X																									
Amaranthaceae	*Amaranthus mitchellii*																																
Amaranthaceae	*Amaranthus undulatus*																														X		
Amaranthaceae	*Gomphrena brachystylis* subsp. *pindanensis*																										X	X					
Amaranthaceae	*Gomphrena canescens*	X	X	X		X	X	X	X						X		X	X	X	X		X	X	X	X	X			X	X	X		X
Amaranthaceae	*Gomphrena occulta*																																
Amaranthaceae	*Ptilotus calostachyus*	X	X																X														
Amaranthaceae	*Ptilotus corymbosus*		X																	X		X					X	X	X				
Amaranthaceae	*Ptilotus fusiformis*																										X					X	
Apocynaceae	**Calotropis procera*																				X												
Apocynaceae	*Carissa lanceolata*			X		X		X	X	X		X	X		X		X			X	X				X	X			X	X	X	X	X
Apocynaceae	*Gymnanthera oblonga*																													X			
Asteraceae	*Blumea integrifolia*																																X
Asteraceae	*Blumea tenella*							X																									X
Asteraceae	*Pluchea tetranthera*		X	X				X	X				X		X		X			X		X	X	X	X	X	X	X	X	X	X	X	X
Asteraceae	*Pterocaulon intermedium*																									X				X	X	X	
Asteraceae	*Pterocaulon serrulatum* var. *velutinum*								X											X									X		X		X
Asteraceae	*Pterocaulon sp.*														X													X					
Bignoniaceae	*Dolichandrone occidentalis*		X			X	X	X						X					X					X			X			X			
Boraginaceae	*Ehretia saligna*	X						X																							X		
Boraginaceae	*Heliotropium cunninghamii*																										X		X				
Boraginaceae	*Heliotropium diversifolium*																							X	X	X							
Boraginaceae	*Heliotropium foliatum*																								X		X						
Boraginaceae	*Heliotropium* sp.					X																											
Boraginaceae	*Trichodesma zeylanicum* var. *zeylanicum*					X	X												X	X			X			X					X	X	X	X
Byblidaceae	*Byblis filifolia*																										X						
Capparaceae	*Capparis lasiantha*																																
Caryophyllaceae	*Polycarpaea corymbosa*			X	X																								X				
Caryophyllaceae	*Polycarpaea holtzei*																																
Caryophyllaceae	*Polycarpaea longiflora*																																
Celastraceae	*Stackhousia intermedia*																											X		X			
Cleomaceae	*Arivela tetrandra*																										X	X					

Family	Species	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06	ELA07	ELA08	ELA09	ELA10	ELA11	ELA12	ELA13	ELA14	ELA15	ELA16	ELA17	ELA18	ELA19	ELA20	ELA21	ELA22	ELA23	ELA24	ELA25	ELA26	ELA27	ELA28	ELA29	ELA30	ELA31	ELA32
Cleomaceae	*Arivela viscosa*																							X				X				X	X
Combretaceae	*Terminalia canescens*																							X	X		X	X	X			X	
Combretaceae	*Terminalia platyphylla*										X	X	X								X												
Commelinaceae	*Murdannia graminea*															X																	
Convolvulaceae	*?Operculina* sp.																																
Convolvulaceae	*Bonamia linearis*					X	X	X									X	X															
Convolvulaceae	*Bonamia pannosa*																	X	X														
Convolvulaceae	*Evolvulus alsinoides*														X						X		X						X				X
Convolvulaceae	*Evolvulus alsinoides* var. *decumbens*			X																					X	X							
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*																								X								
Convolvulaceae	*Ipomoea coptica*																																X
Convolvulaceae	*Ipomoea costata*										X																						
Convolvulaceae	*Ipomoea eriocarpa*																					X											
Convolvulaceae	*Ipomoea plebeia*												X																				
Convolvulaceae	*Ipomoea polymorpha*																																
Convolvulaceae	*Polymeria ambigua*	X		X	X					X	X	X	X	X	X			X		X				X	X	X			X		X	X	
Cucurbitaceae	*Cucumis melo*																	X															
Cucurbitaceae	*Cucumis picriocarpus*									X																							
Cucurbitaceae	*Cucumis variabilis*																													X			
Cyperaceae	*Cyperaceae* sp.												X																				
Cyperaceae	*Cyperus blakeanus*			X																											X		
Cyperaceae	*Cyperus latzii*																																
Cyperaceae	*Cyperus pulchellus*																																
Cyperaceae	*Cyperus* sp.																																
Cyperaceae	*Fimbristylis ferruginea*													X	X	X																	
Cyperaceae	*Fimbristylis schultzii*								X																							X	
Cyperaceae	*Schoenoplectiella lateriflora* var. *lateriflora*																																
Droseraceae	*Drosera derbyensis*		X																									X					
Elatinaceae	*Bergia henshallii*																									X							
Elatinaceae	*Bergia trimera*																					X											
Eriocaulaceae	*Eriocaulon cinereum*																																
Euphorbiaceae	*Euphorbia cinerea*																																
Euphorbiaceae	*Euphorbia psilosperma*	X	X										X															X				X	
Euphorbiaceae	*Euphorbia schultzii* var. *comans*				X	X	X													X		X		X		X					X		
Euphorbiaceae	*Euphorbia trigonosperma*																																
Fabaceae	**Stylosanthes hamata*				X	X	X	X	X				X	X	X					X		X						X	X	X	X		X	
Fabaceae	**Vachellia farnesiana*										X	X	X																				
Fabaceae	*Acacia ancistrocarpa*							X												X		X	X	X	X		X	X				X	
Fabaceae	*Acacia colei*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X		X	X			X	X
Fabaceae	*Acacia eriopoda*			X	X																												
Fabaceae	*Acacia inaequilatera*																																
Fabaceae	*Acacia platycarpa*		X															X	X		X												

Family	Species	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06	ELA07	ELA08	ELA09	ELA10	ELA11	ELA12	ELA13	ELA14	ELA15	ELA16	ELA17	ELA18	ELA19	ELA20	ELA21	ELA22	ELA23	ELA24	ELA25	ELA26	ELA27	ELA28	ELA29	ELA30	ELA31	ELA32
Fabaceae	*Acacia synchronicia*																																
Fabaceae	*Acacia tumida*																																
Fabaceae	*Alysicarpus muelleri*														X												X	X	X				
Fabaceae	*Bauhinia cunninghamii*	X			X			X		X		X	X				X			X	X	X	X		X	X	X		X	X	X	X	
Fabaceae	*Cajanus latisepalus*																													X			
Fabaceae	*Cajanus marmoratus*	X	X				X													X		X		X	X	X					X		X
Fabaceae	*Chamaecrista symonii*																		X														X
Fabaceae	*Crotalaria brevis*																							X	X				X				
Fabaceae	*Crotalaria cunninghamii*				X					X																				X			
Fabaceae	*Crotalaria medicaginea* var. *neglecta*											X	X												X					X		X	
Fabaceae	*Crotalaria montana* var. *angustifolia*									X				X		X																	
Fabaceae	*Crotalaria ramosissima*					X	X	X										X			X										X		
Fabaceae	*Cullen badocanum*					X																X	X								X		
Fabaceae	*Cullen corallum*																X																
Fabaceae	*Dichrostachys spicata*																																
Fabaceae	*Glycine tomentella*																										X						
Fabaceae	*Grona filiformis*																																
Fabaceae	*Indigofera colutea*		X								X									X		X				X	X		X	X	X	X	
Fabaceae	*Indigofera hirsuta*		X							X				X							X				X				X		X	X	X
Fabaceae	*Indigofera linnaei*					X	X			X				X	X					X							X	X	X			X	X
Fabaceae	*Indigofera trita*																																
Fabaceae	*Neptunia gracilis* forma. *gracilis*													X												X						X	
Fabaceae	*Rhynchosia minima*												X												X	X	X		X			X	
Fabaceae	*Senna artemisioides* subsp. *Oligophylla*																																
Fabaceae	*Senna costata*		X																														
Fabaceae	*Senna notabilis*				X	X				X																		X					
Fabaceae	*Sesbania cannabina*																																
Fabaceae	*Tephrosia leptoclada*						X																										
Fabaceae	*Tephrosia remotiflora*	X																															
Fabaceae	*Tephrosia rosea*				X																												
Fabaceae	*Zornia chaetophora*																														X		
Fabaceae	*Zornia prostrata* var. *prostrata*						X	X	X				X												X						X	X	
Fabaceae	*Zornia* sp.					X																											
Fabaceae	*Erythrophleum chlorostachys*	X	X																														
Goodeniaceae	*Goodenia armitiana*					X	X	X	X								X						X								X		
Goodeniaceae	*Goodenia lamprosperma*																																
Goodeniaceae	*Goodenia sepalosa* var. *sepalosa*		X			X			X				X		X										X		X	X	X			X	
Goodeniaceae	*Goodenia* sp.		X																														
Hemerocallidaceae	*Corynotheca micrantha*																																
Hernandiaceae	*Gyrocarpus americanus*					X												X			X												
Lamiaceae	*Clerodendrum ?floribundum*																								X								

Family	Species	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06	ELA07	ELA08	ELA09	ELA10	ELA11	ELA12	ELA13	ELA14	ELA15	ELA16	ELA17	ELA18	ELA19	ELA20	ELA21	ELA22	ELA23	ELA24	ELA25	ELA26	ELA27	ELA28	ELA29	ELA30	ELA31	ELA32
Lauraceae	*Cassytha filiformis*	X		X																													
Linderniaceae	*Lindernia chrysoplectra*																																
Linderniaceae	*Lindernia clausa*																										X	X				X	
Loganiaceae	*Mitrasacme exserta*						X																		X		X	X		X	X		
Loganiaceae	*Mitrasacme hispida*																										X	X					
Loganiaceae	*Mitrasacme lutea*																																
Malvaceae	**Malvastrum americanum*										X																						
Malvaceae	**Melochia pyramidata*							X																									
Malvaceae	*Abutilon hannii*																												X	X	X		
Malvaceae	*Abutilon lepidum*																																
Malvaceae	*Abutilon otocarpum*					X														X	X	X											X
Malvaceae	*Abutilon* sp.							X																									
Malvaceae	*Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618)																					X											
Malvaceae	*Adansonia gregorii*			X		X	X	X	X		X	X	X		X	X	X			X					X					X	X	X	
Malvaceae	*Corchorus fascicularis*									X		X		X														X	X			X	
Malvaceae	*Corchorus sidoides* subsp. *sidoides*	X	X	X	X	X		X										X	X	X	X			X	X	X				X	X		
Malvaceae	*Corchorus sidoides* subsp. *vermicularis*						X	X		X		X	X						X								X	X				X	X
Malvaceae	*Gossypium australe*					X		X	X				X		X		X			X		X			X	X	X	X	X	X	X	X	X
Malvaceae	*Hibiscus austrinus*									X																							
Malvaceae	Malvaceae sp.									X	X	X	X																				
Malvaceae	*Melhania oblongifolia*																																
Malvaceae	*Sida* aff. *fibulifera*																																
Malvaceae	*Sida fibulifera*										X																						
Malvaceae	*Waltheria indica*							X											X														
Marsileaceae	*Marsilea hirsuta*																																
Menispermaceae	*Tinospora smilacina*	X	X	X											X						X					X							
Menyanthaceae	*Nymphoides beaglensis* (P3)																																
Molluginaceae	*Trigastrotheca molluginea*					X																											
Montiaceae	*Calandrinia* sp.																																
Montiaceae	*Calandrinia strophiolata*	X	X																														
Montiaceae	*Calandrinia tepperiana*																																
Myrtaceae	*Corymbia bella*													X																			
Myrtaceae	*Corymbia greeniana*	X	X	X	X		X	X	X				X		X	X	X	X						X	X	X							
Myrtaceae	*Corymbia zygophylla*																		X														
Myrtaceae	*Eucalyptus camaldulensis*										X	X																					
Myrtaceae	*Eucalyptus chlorophylla*			X			X		X																								
Myrtaceae	*Eucalyptus coolabah*		X					X							X																		
Myrtaceae	*Eucalyptus microtheca*									X	X	X	X																				
Myrtaceae	*Eucalyptus tectifica*												X																				
Myrtaceae	*Lophostemon grandiflorus* subsp. *riparius*																																
Myrtaceae	*Melaleuca alsophila*														X	X																	
Nyctaginaceae	*Boerhavia coccinea*	X			X					X	X	X	X	X	X					X					X	X			X	X	X	X	

Family	Species	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06	ELA07	ELA08	ELA09	ELA10	ELA11	ELA12	ELA13	ELA14	ELA15	ELA16	ELA17	ELA18	ELA19	ELA20	ELA21	ELA22	ELA23	ELA24	ELA25	ELA26	ELA27	ELA28	ELA29	ELA30	ELA31	ELA32
Orobanchaceae	*Buchnera asperata*					X	X	X	X																								
Orobanchaceae	*Buchnera ramosissima*					X	X																					X		X	X	X	
Orobanchaceae	*Striga curviflora*						X																	X									
Pedaliaceae	*Josephinia papillosa*																																
Phrymaceae	*Peplidium muelleri*		X					X	X					X			X																
Phrymaceae	*Uvedalia linearis* var. *linearis*																																
Phyllanthaceae	*Flueggea virosa* subsp. *melanthesoides*							X																									
Phyllanthaceae	*Phyllanthus maderaspatensis*	X	X					X		X	X	X	X	X											X		X	X	X	X		X	
Plantaginaceae	*Stemodia lathraia*							X																									
Poaceae	**Cenchrus setiger*																											X	X				
Poaceae	*?Austrostipa* sp.																		X														
Poaceae	*Aristida holathera*	X	X	X	X		X																					X				X	
Poaceae	*Aristida hygrometrica*	X			X			X						X	X	X				X										X		X	
Poaceae	*Aristida latifolia*				X					X	X	X	X					X	X		X		X			X						X	
Poaceae	*Chrysopogon fallax*	X	X					X													X											X	
Poaceae	*Cymbopogon ambiguus*																															X	
Poaceae	*Cynodon convergens*				X	X						X																					
Poaceae	*Dactyloctenium radulans*																												X				
Poaceae	*Enneapogon pallidus*																				X												
Poaceae	*Enneapogon purpurascens*																			X													
Poaceae	*Eragrostis cumingii*																																
Poaceae	*Eragrostis eriopoda*	X																						X	X			X					
Poaceae	*Eragrostis exigua*													X																			
Poaceae	*Eragrostis tenellula*																																
Poaceae	*Eriachne glauca*																																
Poaceae	*Eriachne helmsii*																																
Poaceae	*Eriachne melicacea*																																
Poaceae	*Eriachne obtusa*					X	X	X	X					X	X	X	X	X	X	X	X	X	X				X		X	X	X	X	X
Poaceae	*Eriachne pindanica*																																
Poaceae	*Eulalia aurea*							X																			X						
Poaceae	*Panicum decompositum*				X			X								X		X											X			X	X
Poaceae	*Panicum effusum*																																
Poaceae	*Perotis rara*																											X	X				X
Poaceae	Poaceae sp. 1 (sterile)					X																											
Poaceae	Poaceae sp. 2 (sterile)							X																									
Poaceae	Poaceae sp. 3 (sterile)																																
Poaceae	*Sehima nervosum*									X	X	X	X									X			X	X			X				
Poaceae	*Setaria surgens*																																
Poaceae	*Sorghum plumosum*	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X		
Poaceae	*Sorghum stipoideum*																				X												
Poaceae	*Sporobolus australasicus*				X	X		X	X	X	X															X	X	X	X			X	X
Poaceae	*Triodia bitextura*	X	X	X																								X					

Family	Species	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06	ELA07	ELA08	ELA09	ELA10	ELA11	ELA12	ELA13	ELA14	ELA15	ELA16	ELA17	ELA18	ELA19	ELA20	ELA21	ELA22	ELA23	ELA24	ELA25	ELA26	ELA27	ELA28	ELA29	ELA30	ELA31	ELA32
Poaceae	*Triodia epactia*																																
Poaceae	*Triodia intermedia*					X		X																X	X	X	X	X	X	X	X	X	
Poaceae	*Triodia* sp.																	X			X												
Poaceae	*Triodia wiseana*																																X
Poaceae	*Urochloa holosericea*																															X	
Poaceae	*Urochloa occidentalis* var. *occidentalis*											X																					
Poaceae	*Xerochloa barbata*																																
Polygalaceae	*Polygala galeocephala*			X											X									X		X	X			X			
Polygalaceae	*Polygala tepperi*	X	X																						X	X							
Portulacaceae	**Portulaca oleracea*				X									X																		X	
Portulacaceae	**Portulaca pilosa*																								X	X		X	X	X		X	
Portulacaceae	*Portulaca digyna*				X											X																X	
Portulacaceae	*Portulaca oligosperma*									X																							
Proteaceae	*Grevillea pyramidalis*		X	X		X	X								X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Proteaceae	*Grevillea wickhamii*		X																														
Proteaceae	*Hakea arborescens*					X			X			X	X	X	X	X	X			X			X		X					X	X	X	
Proteaceae	*Hakea chordophylla*					X	X	X	X						X								X				X				X		
Proteaceae	*Hakea macrocarpa*						X	X	X													X		X	X	X	X		X	X	X		
Rubiaceae	*Psydrax* sp.																																
Rubiaceae	*Scleromitrion scleranthoides*																								X								
Rubiaceae	*Spermacoce occidentalis*									X	X	X	X	X				X									X	X	X	X		X	
Santalaceae	*Santalum lanceolatum*											X																					
Sapindaceae	*Atalaya hemiglauca*	X							X		X	X	X							X	X				X	X			X	X	X		X
Sapindaceae	*Cardiospermum halicacabum* var. *halicacabum*										X		X																				
Sapindaceae	*Dodonaea hispidula* var. *arida*																																
Solanaceae	*Solanum quadriloculatum*				X																												
Thymelaeaceae	*Pimelea punicea*																																
Violaceae	*Afrohybanthus aurantiacus*																																
Violaceae	*Afrohybanthus enneaspermus*										X																			X		X	
Zygophyllaceae	*Roepera* sp.																															X	

Quadrats 33-64

Family	Species	ELA33	ELA34	ELA35	ELA36	ELA37	ELA38	ELA39	ELA40	ELA41	ELA42	ELA43	ELA44	ELA45	ELA46	ELA47	ELA48	ELA49	ELA50	ELA51	ELA52	ELA53	ELA54	ELA55	ELA56	ELA57	ELA58	ELA59	ELA60	ELA61	ELA62	ELA63	ELA64
Acanthaceae	*Rostellularia adscendens* var. *clementii*																																
Aizoaceae	**Trianthema pilosum*											X		X						X		X			X						X		
Aizoaceae	*Trianthema oxycalyptrum* var. *oxycalyptrum*		X		X																												
Amaranthaceae	*Achyranthes aspera*																												X				

Family	Species	ELA33	ELA34	ELA35	ELA36	ELA37	ELA38	ELA39	ELA40	ELA41	ELA42	ELA43	ELA44	ELA45	ELA46	ELA47	ELA48	ELA49	ELA50	ELA51	ELA52	ELA53	ELA54	ELA55	ELA56	ELA57	ELA58	ELA59	ELA60	ELA61	ELA62	ELA63	ELA64
Amaranthaceae	*Alternanthera angustifolia*																										X						
Amaranthaceae	*Alternanthera nana*																																
Amaranthaceae	*Amaranthus mitchellii*																							X									
Amaranthaceae	*Amaranthus undulatus*											X																X					
Amaranthaceae	*Gomphrena brachystylis* subsp. *pindanensis*	X																															
Amaranthaceae	*Gomphrena canescens*		X	X	X	X	X	X	X	X	X		X		X		X					X	X		X				X				
Amaranthaceae	*Gomphrena occulta*						X																										
Amaranthaceae	*Ptilotus calostachyus*																																
Amaranthaceae	*Ptilotus corymbosus*							X											X														
Amaranthaceae	*Ptilotus fusiformis*							X	X																								
Apocynaceae	**Calotropis procera*	X		X																								X	X				
Apocynaceae	*Carissa lanceolata*	X			X	X	X			X	X	X	X	X			X			X		X	X	X						X	X		
Apocynaceae	*Gymnanthera oblonga*																												X	X			
Asteraceae	*Blumea integrifolia*		X		X																												
Asteraceae	*Blumea tenella*				X	X																											
Asteraceae	*Pluchea tetranthera*	X	X	X			X	X	X	X	X				X	X		X					X		X							X	
Asteraceae	*Pterocaulon intermedium*	X						X	X																								
Asteraceae	*Pterocaulon serrulatum* var. *velutinum*											X				X												X					
Asteraceae	*Pterocaulon* sp.																																
Bignoniaceae	*Dolichandrone occidentalis*		X	X				X	X	X			X	X	X	X				X		X			X			X					
Boraginaceae	*Ehretia saligna*											X		X															X				
Boraginaceae	*Heliotropium cunninghamii*	X																															
Boraginaceae	*Heliotropium diversifolium*																														X		
Boraginaceae	*Heliotropium foliatum*							X	X																								
Boraginaceae	*Heliotropium* sp.																																
Boraginaceae	*Trichodesma zeylanicum* var. *zeylanicum*	X					X	X	X																								
Byblidaceae	*Byblis filifolia*																															X	
Capparaceae	*Capparis lasiantha*										X																		X				
Caryophyllaceae	*Polycarpaea corymbosa*							X	X																								
Caryophyllaceae	*Polycarpaea holtzei*	X																															
Caryophyllaceae	*Polycarpaea longiflora*						X																										
Celastraceae	*Stackhousia intermedia*	X																					X										
Cleomaceae	*Arivela tetrandra*							X	X											X		X											
Cleomaceae	*Arivela viscosa*	X	X		X	X		X				X						X		X		X		X	X	X	X				X		
Combretaceae	*Terminalia canescens*	X								X	X																						
Combretaceae	*Terminalia platyphylla*																																
Commelinaceae	*Murdannia graminea*						X																									X	
Convolvulaceae	*?Operculina* sp.																X																
Convolvulaceae	*Bonamia linearis*											X					X	X	X	X	X	X	X						X	X	X			
Convolvulaceae	*Bonamia pannosa*							X	X					X			X	X	X	X		X	X						X	X	X	X	X	X
Convolvulaceae	*Evolvulus alsinoides*		X			X		X	X												X			X					X				
Convolvulaceae	*Evolvulus alsinoides* var. *decumbens*									X	X					X			X													X	

Family	Species	ELA33	ELA34	ELA35	ELA36	ELA37	ELA38	ELA39	ELA40	ELA41	ELA42	ELA43	ELA44	ELA45	ELA46	ELA47	ELA48	ELA49	ELA50	ELA51	ELA52	ELA53	ELA54	ELA55	ELA56	ELA57	ELA58	ELA59	ELA60	ELA61	ELA62	ELA63	ELA64
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*															X	X								X		X						
Convolvulaceae	*Ipomoea coptica*		X		X																												
Convolvulaceae	*Ipomoea costata*																																
Convolvulaceae	*Ipomoea eriocarpa*																																
Convolvulaceae	*Ipomoea plebeia*																																
Convolvulaceae	*Ipomoea polymorpha*																														X		
Convolvulaceae	*Polymeria ambigua*	X					X	X	X	X	X	X							X	X	X		X	X				X	X		X	X	
Cucurbitaceae	*Cucumis melo*						X																								X		
Cucurbitaceae	*Cucumis picriocarpus*																																
Cucurbitaceae	*Cucumis variabilis*																																
Cyperaceae	*Cyperaceae* sp.																																
Cyperaceae	*Cyperus blakeanus*															X		X															
Cyperaceae	*Cyperus latzii*																								X								
Cyperaceae	*Cyperus pulchellus*																																X
Cyperaceae	*Cyperus* sp.						X																										
Cyperaceae	*Fimbristylis ferruginea*												X		X																		X
Cyperaceae	*Fimbristylis schultzii*		X	X	X			X	X	X																							X
Cyperaceae	*Schoenoplectiella lateriflora* var. *lateriflora*																										X						
Droseraceae	*Drosera derbyensis*												X																				
Elatinaceae	*Bergia henshallii*									X						X																	
Elatinaceae	*Bergia trimera*																	X															
Eriocaulaceae	*Eriocaulon cinereum*																										X						
Euphorbiaceae	*Euphorbia cinerea*	X																										X					
Euphorbiaceae	*Euphorbia psilosperma*	X						X	X	X	X	X	X	X	X		X	X		X	X	X	X		X								
Euphorbiaceae	*Euphorbia schultzii* var. *comans*				X							X							X		X							X			X	X	
Euphorbiaceae	*Euphorbia trigonosperma*						X																										
Fabaceae	**Stylosanthes hamata*		X								X																						X
Fabaceae	**Vachellia farnesiana*				X					X														X	X		X						
Fabaceae	*Acacia ancistrocarpa*																					X										X	
Fabaceae	*Acacia colei*									X	X					X								X	X		X						
Fabaceae	*Acacia eriopoda*																																
Fabaceae	*Acacia inaequilatera*							X																									
Fabaceae	*Acacia platycarpa*											X		X						X									X		X	X	
Fabaceae	*Acacia synchronicia*				X	X	X																										
Fabaceae	*Acacia tumida*																		X	X	X	X						X	X	X	X	X	
Fabaceae	*Alysicarpus muelleri*													X																			
Fabaceae	*Bauhinia cunninghamii*						X				X	X		X						X	X	X		X					X		X		
Fabaceae	*Cajanus latisepalus*																																
Fabaceae	*Cajanus marmoratus*			X			X	X	X	X	X		X	X				X		X	X	X						X			X	X	
Fabaceae	*Chamaecrista symonii*		X	X	X	X													X		X								X				
Fabaceae	*Crotalaria brevis*						X			X		X		X																				
Fabaceae	*Crotalaria cunninghamii*											X																			X		

Family	Species	ELA33	ELA34	ELA35	ELA36	ELA37	ELA38	ELA39	ELA40	ELA41	ELA42	ELA43	ELA44	ELA45	ELA46	ELA47	ELA48	ELA49	ELA50	ELA51	ELA52	ELA53	ELA54	ELA55	ELA56	ELA57	ELA58	ELA59	ELA60	ELA61	ELA62	ELA63	ELA64
Fabaceae	*Crotalaria medicaginea* var. *neglecta*	X					X	X	X	X			X											X						X		
Fabaceae	*Crotalaria montana* var. *angustifolia*				X																												
Fabaceae	*Crotalaria ramosissima*		X																														
Fabaceae	*Cullen badocanum*				X	X																											
Fabaceae	*Cullen corallum*																																
Fabaceae	*Dichrostachys spicata*					X	X																										
Fabaceae	*Glycine tomentella*											X																					
Fabaceae	*Grona filiformis*		X	X											X							X			X								
Fabaceae	*Indigofera colutea*	X				X	X	X	X	X	X	X		X		X																	
Fabaceae	*Indigofera hirsuta*																							X	X								
Fabaceae	*Indigofera linifolia*	X	X	X	X	X	X	X	X				X			X					X	X			X			X				X	
Fabaceae	*Indigofera linnaei*	X	X			X		X																								X	
Fabaceae	*Indigofera trita*			X																													
Fabaceae	*Neptunia gracilis* forma. *gracilis*	X								X																							
Fabaceae	*Rhynchosia minima*	X					X	X	X	X						X																	
Fabaceae	*Senna artemisioides* subsp. *Oligophylla*									X																							
Fabaceae	*Senna costata*											X																	X				
Fabaceae	*Senna notabilis*							X	X			X										X		X				X			X		
Fabaceae	*Sesbania cannabina*																									X							X
Fabaceae	*Tephrosia leptoclada*									X																							
Fabaceae	*Tephrosia remotiflora*																																
Fabaceae	*Tephrosia rosea*							X	X											X	X										X	X	
Fabaceae	*Zornia chaetophora*																														X		
Fabaceae	*Zornia prostrata* var. *prostrata*																												X		X		
Fabaceae	*Zornia* sp.																																
Fabaceae	*Erythrophleum chlorostachys*																X	X	X	X	X	X	X										
Goodeniaceae	*Goodenia armitiana*																																
Goodeniaceae	*Goodenia lamprosperma*															X																	
Goodeniaceae	*Goodenia sepalosa* var. *sepalosa*	X		X			X	X	X					X			X		X				X									
Goodeniaceae	*Goodenia* sp.																					X											
Hemerocallidaceae	*Corynotheca micrantha*																												X				
Hernandiaceae	*Gyrocarpus americanus*											X		X						X									X		X	X	
Lamiaceae	*Clerodendrum ?floribundum*																																
Lauraceae	*Cassytha filiformis*		X		X		X	X		X	X								X	X			X					X				
Linderniaceae	*Lindernia chrysoplectra*																																X
Linderniaceae	*Lindernia clausa*																																
Loganiaceae	*Mitrasacme exserta*	X																															
Loganiaceae	*Mitrasacme hispida*																																
Loganiaceae	*Mitrasacme lutea*																																X
Malvaceae	**Malvastrum americanum*																																
Malvaceae	**Melochia pyramidata*																																
Malvaceae	*Abutilon hannii*																																

Family	Species	ELA33	ELA34	ELA35	ELA36	ELA37	ELA38	ELA39	ELA40	ELA41	ELA42	ELA43	ELA44	ELA45	ELA46	ELA47	ELA48	ELA49	ELA50	ELA51	ELA52	ELA53	ELA54	ELA55	ELA56	ELA57	ELA58	ELA59	ELA60	ELA61	ELA62	ELA63	ELA64
Malvaceae	*Abutilon lepidum*							X				X												X									
Malvaceae	*Abutilon otocarpum*			X		X					X	X				X									X			X	X	X			
Malvaceae	*Abutilon* sp.																																
Malvaceae	*Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618)																																
Malvaceae	*Adansonia gregorii*	X	X					X	X	X	X		X		X																		
Malvaceae	*Corchorus fascicularis*	X					X	X		X	X	X				X								X									
Malvaceae	*Corchorus sidoides* subsp. *sidoides*							X	X			X	X	X			X	X		X	X	X	X		X		X	X	X	X	X	X	
Malvaceae	*Corchorus sidoides* subsp. *vermicularis*	X				X	X	X	X		X													X									
Malvaceae	*Gossypium australe*	X		X	X	X	X	X	X	X				X		X	X						X	X									
Malvaceae	*Hibiscus austrinus*									X														X									
Malvaceae	Malvaceae sp.																																
Malvaceae	*Melhania oblongifolia*											X																					
Malvaceae	*Sida aff. fibulifera*																												X				
Malvaceae	*Sida fibulifera*																																
Malvaceae	*Waltheria indica*																		X		X		X						X	X	X		
Marsileaceae	*Marsilea hirsuta*															X										X							X
Menispermaceae	*Tinospora smilacina*											X						X	X	X	X			X				X	X				
Menyanthaceae	*Nymphoides beaglensis* (P3)																									X	X						X
Molluginaceae	*Trigastrotheca molluginea*							X	X														X										
Montiaceae	*Calandrinia* sp.																					X											
Montiaceae	*Calandrinia strophiolata*											X				X	X		X	X							X	X					
Montiaceae	*Calandrinia tepperiana*		X																														X
Myrtaceae	*Corymbia bella*																								X	X	X						
Myrtaceae	*Corymbia greeniana*										X		X		X		X			X	X		X	X				X			X	X	
Myrtaceae	*Corymbia zygophylla*											X							X	X	X							X	X				
Myrtaceae	*Eucalyptus camaldulensis*																																
Myrtaceae	*Eucalyptus chlorophylla*																																
Myrtaceae	*Eucalyptus coolabah*															X		X															X
Myrtaceae	*Eucalyptus microtheca*																																
Myrtaceae	*Eucalyptus tectifica*																																
Myrtaceae	*Lophostemon grandiflorus* subsp. *riparius*																								X	X							
Myrtaceae	*Melaleuca alsophila*									X	X							X							X					X			
Nyctaginaceae	*Boerhavia coccinea*	X					X	X	X	X		X	X	X	X		X	X	X	X	X	X		X	X						X	X	
Orobanchaceae	*Buchnera asperata*		X		X																									X			
Orobanchaceae	*Buchnera ramosissima*				X			X	X													X										X	
Orobanchaceae	*Striga curviflora*							X																									
Pedaliaceae	*Josephinia papillosa*							X																									
Phrymaceae	*Peplidium muelleri*															X									X	X	X						
Phrymaceae	*Uvedalia linearis* var. *linearis*																																X
Phyllanthaceae	*Flueggea virosa* subsp. *melanthesoides*									X	X													X									
Phyllanthaceae	*Phyllanthus maderaspatensis*		X					X	X	X	X																						

Family	Species	ELA33	ELA34	ELA35	ELA36	ELA37	ELA38	ELA39	ELA40	ELA41	ELA42	ELA43	ELA44	ELA45	ELA46	ELA47	ELA48	ELA49	ELA50	ELA51	ELA52	ELA53	ELA54	ELA55	ELA56	ELA57	ELA58	ELA59	ELA60	ELA61	ELA62	ELA63	ELA64
Plantaginaceae	*Stemodia lathraia*				X																												
Poaceae	**Cenchrus setiger*							X	X					X			X														X		
Poaceae	*?Austrostipa* sp.																																
Poaceae	*Aristida holathera*	X						X	X																								
Poaceae	*Aristida hygrometrica*						X	X	X			X	X	X	X	X	X	X	X	X	X	X	X				X	X			X	X	
Poaceae	*Aristida latifolia*		X	X		X						X				X	X					X	X					X	X		X	
Poaceae	*Chrysopogon fallax*									X																							
Poaceae	*Cymbopogon ambiguus*	X																											X				
Poaceae	*Cynodon convergens*					X		X	X	X	X						X	X															
Poaceae	*Dactyloctenium radulans*		X		X	X	X			X																							
Poaceae	*Enneapogon pallidus*					X																											
Poaceae	*Enneapogon purpurascens*																																
Poaceae	*Eragrostis cumingii*					X																											
Poaceae	*Eragrostis eriopoda*						X	X	X	X						X	X	X			X	X			X		X					X	
Poaceae	*Eragrostis exigua*																																
Poaceae	*Eragrostis tenellula*		X	X		X																											
Poaceae	*Eriachne glauca*				X																												
Poaceae	*Eriachne helmsii*	X																															
Poaceae	*Eriachne melicacea*																											X					
Poaceae	*Eriachne obtusa*		X	X		X					X		X	X	X				X	X	X		X					X	X	X	X		X
Poaceae	*Eriachne pindanica*																													X			
Poaceae	*Eulalia aurea*																															X	
Poaceae	*Panicum decompositum*		X			X		X		X																							
Poaceae	*Panicum effusum*												X			X																	
Poaceae	*Perotis rara*	X					X					X	X	X		X															X		
Poaceae	Poaceae sp. 1 (sterile)																																
Poaceae	Poaceae sp. 2 (sterile)																																
Poaceae	Poaceae sp. 3 (sterile)			X																													
Poaceae	*Sehima nervosum*				X	X	X																										
Poaceae	*Setaria surgens*																		X													X	
Poaceae	*Sorghum plumosum*	X	X	X			X	X	X	X	X		X		X		X				X												
Poaceae	*Sorghum stipoideum*																																
Poaceae	*Sporobolus australasicus*	X		X	X	X	X	X	X	X	X				X	X																	
Poaceae	*Triodia bitextura*									X	X				X	X			X	X	X		X		X		X			X	X	X	X
Poaceae	*Triodia epactia*																															X	
Poaceae	*Triodia intermedia*	X	X	X	X		X	X	X	X																						X	
Poaceae	*Triodia sp.*																																
Poaceae	*Triodia wiseana*					X																			X			X	X				
Poaceae	*Urochloa holosericea*	X																															
Poaceae	*Urochloa occidentalis* var. *occidentalis*																																
Poaceae	*Xerochloa barbata*		X	X	X	X																											
Polygalaceae	*Polygala galeocephala*																																

Family	Species	ELA33	ELA34	ELA35	ELA36	ELA37	ELA38	ELA39	ELA40	ELA41	ELA42	ELA43	ELA44	ELA45	ELA46	ELA47	ELA48	ELA49	ELA50	ELA51	ELA52	ELA53	ELA54	ELA55	ELA56	ELA57	ELA58	ELA59	ELA60	ELA61	ELA62	ELA63	ELA64
Polygalaceae	*Polygala tepperi*						X							X				X			X												
Portulacaceae	**Portulaca oleracea*	X								X	X	X								X				X									
Portulacaceae	**Portulaca pilosa*		X								X	X	X	X		X											X						
Portulacaceae	*Portulaca digyna*	X						X	X											X	X		X										
Portulacaceae	*Portulaca oligosperma*																																
Proteaceae	*Grevillea pyramidalis*						X	X	X	X	X				X													X					
Proteaceae	*Grevillea wickhamii*																				X												
Proteaceae	*Hakea arborescens*	X									X																						
Proteaceae	*Hakea chordophylla*	X						X	X						X																		
Proteaceae	*Hakea macrocarpa*						X	X		X	X		X		X								X							X		X		
Rubiaceae	*Psydrax* sp.														X																		
Rubiaceae	*Scleromitrion scleranthoides*																																X
Rubiaceae	*Spermacoce occidentalis*	X	X																													X	
Santalaceae	*Santalum lanceolatum*																																
Sapindaceae	*Atalaya hemiglauca*	X			X	X				X	X	X		X		X	X	X		X				X							X		
Sapindaceae	*Cardiospermum halicacabum* var. *halicacabum*																																
Sapindaceae	*Dodonaea hispidula* var. *arida*																						X										
Solanaceae	*Solanum quadriloculatum*						X																					X	X				
Thymelaeaceae	*Pimelea punicea*	X																															
Violaceae	*Afrohybanthus aurantiacus*							X	X																						X	X	
Violaceae	*Afrohybanthus enneaspermus*	X				X				X	X																						
Zygophyllaceae	*Roepera* sp.																			X													

Appendix F Quadrat site data

Quadrat number	Date	Quadrat type	Easting	Northing	Zone	Landform	Aspect	Slope (%)	Soil description	Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation Community	Fauna habitat
ELA01	6/03/2021	50 x 50	687296	8006395	51	Slope	NW	1	Moist red brown sandy loam	Excellent	N/A	Young (1-10)	AgCgEc	Fauna habitat 1
ELA02	6/03/2021	50 x 50	687746	8006336	51	Slope / flat dune crest	W	1	Moist brown sandy loam	Excellent	N/A	Young (1-10)	AgCgEc	Fauna habitat 1
ELA03	6/03/2021	50 x 50	686802	8002232	51	Flat	N/A	N/A	Moist brown sandy loam	Excellent	N/A	Old (>20)	AgCgEc	Fauna habitat 1
ELA04	6/03/2021	50 x 50	686963	8001840	51	Slope	SW	0.5	Dry red sand / fine gravel	Poor	Previous clearing, weeds	Old (>20)	EmEcAg	Fauna habitat 3
ELA05	25/05/2021	50 x 50	686873	7998414	51	Flat	N/A	N/A	Dry red brown sand	Very Good	Minor weeds, tracks	Recent (<1)	CgAgBc	Fauna habitat 1
ELA06	25/05/2021	50 x 50	688074	7998385	51	Flat	N/A	N/A	Dry light brown to red sandy clay	Very Good	Tracks, weeds	Young (1-10)	CgAgBc	Fauna habitat 1
ELA07	25/05/2021	50 x 50	688535	7998364	51	Gentle slope	SE	1	Dry light brown sandy clay	Good	Weeds, tracks, rubbish dumping	Young (1-10)	CgAgBc	Fauna habitat 1
ELA08	25/05/2021	50 x 50	689942	7998198	51	Flat	N/A	N/A	Dry light brown sandy clay	Good	Cattle tracks and adjacent vehicle tracks, weeds	Young (1-10)	CgAgBc	Fauna habitat 1
ELA09	6/03/2021	50 x 50	692110	7997908	51	Flat	N/A	N/A	Moist brown clay loam	Very Good	Cattle grazing	Old (>20)	EmEcAg	Fauna habitat 3
ELA10	6/03/2021	50 x 50	692546	7997874	51	Flat	E	0.5	Moist brown clay loam	Very Good	Cattle grazing and weeds	Old (>20)	EmEcAg	Fauna habitat 3
ELA11	9/03/2021	50 x 50	692598	7997881	51	Slope / drainage line / creek embankment	W	0.5	Dry brown light clay	Very Good	Cattle tracks, weeds	Old (>20)	EmEcAg	Fauna habitat 3
ELA12	9/03/2021	50 x 50	692853	7997861	51	Slope / creek embankment	W	0.5	Dry red brown sand	Very Good	Tracks, cattle activity, weeds	Old (>20)	EmEcAg	Fauna habitat 3

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Quadrat number	Date	Quadrat type	Easting	Northing	Zone	Landform	Aspect	Slope (%)	Soil description	Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation Community	Fauna habitat
ELA13	9/03/2021	50 x 50	693108	7997839	51	Flat / open depression	N/A	N/A	Slightly moist brown grey clay	Very Good	Minor cattle tracks, weeds	Young (1-10) (Likely unundated recently)	CbEc	Fauna habitat 3
ELA14	9/03/2021	50 x 50	693720	7997803	51	Flat	N/A	N/A	Moist light red brown sandy clay loam	Very Good	Cattle tracks and adjacent vehicle tracks, weeds	Young (1-10)	CgAgBc	Fauna habitat 1
ELA15	9/03/2021	50 x 50	694001	7997454	51	Open depression	N/A	N/A	Moist light brown to orange clay with a sandy surface	Very Good	Cattle tracks	Young (1-10)	CgAgBc	Fauna habitat 1
ELA16	25/05/2021	50 x 50	695406	7996200	51	Flat	N/A	N/A	Dry light brown clay	Very Good	Minor cattle activity	Recent (<1)	CgAgBc	Fauna habitat 1
ELA17	25/05/2021	50 x 50	695254	7994817	51	Flat	N/A	N/A	Dry light brown to red sand	Very Good	Cattle tracks	Moderate (10-20)	CgCzBc	Fauna habitat 2
ELA18	25/05/2021	50 x 50	693266	7993507	51	Gentle slope, dune slope	SE	3	Dry red sand	Very Good	Cattle activity	Recent (<1)	CgCzBc	Fauna habitat 2
ELA19	26/05/2021	50 x 50	690482	7993326	51	Flat between dunes	N/A	N/A	Dry light brown clay	Very Good	Cattle tracks, minor weeds	Young (1-10)	AgBc	Fauna habitat 1
ELA20	26/05/21	50 x 50	687949	7993198	51	Dune slope / crest	N	3	Dry red sand	Very Good	Cattle grazing and tracks, weeds	Young (1-10)	CgCzBc	Fauna habitat 2
ELA21	26/05/21	50 x 50	687755	7992990	51	Flat	N/A	N/A	Dry light brown sandy clay	Very Good	Minor cattle activity, weeds	Recent (<1)	AgBc	Fauna habitat 1
ELA22	26/05/21	50 x 50	686909	7992992	51	Flat	N/A	N/A	Dry brown sandy light clay	Very Good	Minor cattle activity	Recent (<1)	CgAgBc	Fauna habitat 1
ELA23	9/03/21	50 x 50	685643	7992721	51	Flat / upland	N/A	N/A	Moist brown sand	Excellent	N/A	Old (>20)	BcCg	Fauna habitat 1
ELA24	9/03/21	50 x 50	685634	7991962	51	Flat / upland	N/A	N/A	Moist brown sand	Excellent	Tracks, cattle activity, weeds	Old (>20)	BcCg	Fauna habitat 1
ELA25	9/03/21	50 x 50	685626	7991575	51	Slope	NW	0.5	Dry pale brown light clay	Excellent	Weeds	Old (>20)	BcCg	Fauna habitat 1
ELA26	9/03/21	50 x 50	689918	7985266	51	Open depression	N/A	N/A	Moist brown clay	Very Good	Cattle tracks and scats, weeds	Young (1-10)	BcTc	Fauna habitat 1

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Quadrat number	Date	Quadrat type	Easting	Northing	Zone	Landform	Aspect	Slope (%)	Soil description	Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation Community	Fauna habitat
ELA27	9/03/21	50 x 50	690616	7985383	51	Open depression	N/A	N/A	Moist brown loam to clay	Very Good	Cattle tracks, weeds	Moderate (10-20)	BcTc	Fauna habitat 1
ELA28	8/03/21	50 x 50	691284	7985129	51	Flat	N/A	N/A	Moist brown clay loam	Excellent	Cattle tracks and adjacent vehicle tracks, weeds	Old (>20)	BcTc	Fauna habitat 1
ELA29	9/03/21	50 x 50	692961	7985886	51	Flat	N/A	N/A	Moist light brown clay loam	Good	Cattle tracks, weeds	Young (1-10)	AgBc	Fauna habitat 1
ELA30	27/05/21	50 x 50	694977	7985901	51	Flat	N/A	N/A	Dry light brown sandy clay	Very Good	Minor cattle activity	Young (1-10)	AgBc	Fauna habitat 1
ELA31	9/03/21	50 x 50	696524	7985668	51	Flat / open depression	N/A	N/A	Moist light brown clay	Good	Grazing, tracks, heavy cattle activity, weeds	Young (1-10)	Ag	Fauna habitat 1
ELA32	27/05/21	50 x 50	697659	7986009	51	Flat	N/A	N/A	Dry red brown sandy clay	Very Good	Minor cattle activity	Moderate (10-20)	AtAcDo	Fauna habitat 1
ELA33	9/03/21	50 x 50	699041	7985804	51	Gentle slope / open depression	SE	1	Dry red brown clay pan	Very Good	Cattle tracks, weeds	Young (1-10)	Ag	Fauna habitat 1
ELA34	26/05/21	50 x 50	688934	7980819	51	Flat / open depression	N/A	N/A	Dry light brown clay	Very Good	Minor cattle activity, weeds	Young (1-10)	AtAcDo	Fauna habitat 1
ELA35	26/05/21	50 x 50	690150	7979852	51	Flat / open depression	N/A	N/A	Dry brown clay loam with surface crust	Very Good	Minor cattle activity, weeds	Young (1-10)	AtAcDo	Fauna habitat 1
ELA36	26/05/21	50 x 50	692240	7980547	51	Flat to gentle slope or open depression	N/A	N/A	Dry light brown clay	Good	Grazing, tracks, heavy cattle activity, weeds	Young (1-10)	AtAcDo	Fauna habitat 1
ELA37	27/05/21	50 x 50	692645	7980711	51	Flat	N/A	N/A	Dry light brown sandy clay	Very Good	Cattle pugging, tracks, scats	Young (1-10)	AtAcDo	Fauna habitat 1
ELA38	9/03/21	50 x 50	694543	7981096	51	Flat	N/A	N/A	Dry brown light clay	Excellent	Adjacent tracks	Old (>20)	BcCg	Fauna habitat 1
ELA39	7/03/21	50 x 50	696593	7980098	51	Gentle slope	NW	0.5	Dry light brown clay	Poor	Previous clearing, cattle scats, weeds	Young (1-10)	Ag	Fauna habitat 1

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Quadrat number	Date	Quadrat type	Easting	Northing	Zone	Landform	Aspect	Slope (%)	Soil description	Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation Community	Fauna habitat
ELA40	7/03/21	50 x 50	697909	7980047	51	Flat	SE	0.5	Moist grey brown sandy loam to clay	Good	Cattle tracks, scats and grazing, previous clearing	Young (1-10)	Ag	Fauna habitat 1
ELA41	7/03/21	50 x 50	701517	7980279	51	Flat	N/A	N/A	Moist brown clay loam	Excellent	Tracks, weeds	Old (>20)	AgCgEc	Fauna habitat 1
ELA42	7/03/21	50 x 50	702048	7980340	51	Flat	N/A	N/A	Dry light brown clay loam	Excellent	Tracks, cattle activity, weeds	N/A	AgCgEc	Fauna habitat 1
ELA43	8/03/21	50 x 50	704590	7982476	51	Dune crest	N/A	N/A	Dry red sand	Excellent	Weeds	Moderate (10-20)	BcGaCg	Fauna habitat 2
ELA44	8/03/21	50 x 50	704483	7981302	51	Flat / open depression	N/A	N/A	Moist brown sand	Excellent	Weeds	Old (>20)	CgAgBc	Fauna habitat 1
ELA45	8/03/21	50 x 50	704492	7980578	51	Flat	NW	0.5	Dry orange red sandy clay	Very Good	Adjacent tracks, weeds	Young (1-10)	BcGaCg	Fauna habitat 2
ELA46	8/03/21	50 x 50	705136	7980954	51	Flat	N/A	N/A	Dry light brown to red sandy clay	Excellent	Adjacent tracks	Young (1-10)	CgAgBc	Fauna habitat 1
ELA47	8/03/21	50 x 50	706410	7981270	51	Slope / wetland fringe	S	1	Moist brown sandy loam	Excellent	Tracks, weeds	Old (>20)	CbEc	Fauna habitat 3
ELA48	8/03/21	50 x 50	707228	7981171	51	Flat	N/A	N/A	Moist orange brown sand	Excellent	Tracks, weeds	Old (>20)	EcCg	Fauna habitat 2
ELA49	8/03/21	50 x 50	708001	7981195	51	Flat	N/A	N/A	Moist orange brown sand	Excellent	Tracks	Old (>20)	EcCg	Fauna habitat 2
ELA50	8/03/21	50 x 50	708693	7980594	51	Flat	N/A	N/A	Dry red sand to clay	Excellent	Fire	Young (1-10)	CzEcCg	Fauna habitat 2
ELA51	8/03/21	50 x 50	708722	7979400	51	Dune slope / swale	N/A	N/A	Dry red sand / dune swale	Excellent	Fire	Young (1-10)	BcGaCg	Fauna habitat 2
ELA52	7/03/21	50 x 50	708773	7978101	51	Flat	N/A	N/A	Dry red sand	Very Good	Cattle grazing and tracks	Young (1-10)	CzEcCg	Fauna habitat 2
ELA53	7/03/21	50 x 50	709731	7978391	51	Flat	N/A	N/A	Dry red sand	Very Good	Tracks, previous clearing, burnt	North = Young (1-10), South = Old (>20)	EcCg	Fauna habitat 2

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Quadrat number	Date	Quadrat type	Easting	Northing	Zone	Landform	Aspect	Slope (%)	Soil description	Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation Community	Fauna habitat
ELA54	7/03/21	50 x 50	711252	7978417	51	Flat	N/A	N/A	Dry light brown to red sandy clay	Very Good	Fire, minor cattle activity	Young (1-10)	EcCg	Fauna habitat 2
ELA55	7/03/21	50 x 50	712051	7978400	51	Flat	N/A	N/A	Dry light brown sandy loam	Poor	Heavy cattle grazing and tracks, minor rubbish dumping, weeds	Moderate (10-20)	EmEcAg	Fauna habitat 3
ELA56	7/03/21	50 x 50	713211	7978357	51	Slope / wetland fringe	W	2	Moist orange brown sandy clay loam	Excellent	Weeds	Old (>20)	CbEc	Fauna habitat 3
ELA57	7/03/21	50 x 50	713276	7978347	51	Closed depression	N/A	N/A	Inundated brown light clay with moss	Very Good	Cattle tracks and scats	Moderate (10-20)	CbEc	Fauna habitat 3
ELA58	7/03/21	50 x 50	713620	7978355	51	Slope / wetland fringe	W	2	Moist bark brown sandy clay loam	Excellent	Tracks, weeds	Old (>20)	CbEc	Fauna habitat 3
ELA59	27/05/21	50 x 50	711942	7976870	51	Gentle dune slope	S	2	Dry red sand	Very Good	Minor cattle activity, weeds	Young (1-10)	CzEcCg	Fauna habitat 2
ELA60	27/05/21	50 x 50	713616	7976552	51	Gentle dune slope / crest	N	1.5	Dry red sand	Very Good	Minor cattle activity, weeds	Young (1-10)	CzEcCg	Fauna habitat 2
ELA61	27/05/21	50 x 50	715782	7976497	51	Dune swale / flat	N/A	N/A	Dry light brown to red clay	Very Good	Cattle tracks	Young (1-10)	CzEcCg	Fauna habitat 2
ELA62	4/03/21	50 x 50	716840	7976435	51	Dune ridge	S	2	Dry red sand	Excellent	Minor weeds	Moderate (10-20)	BcGaCg	Fauna habitat 2
ELA63	4/03/21	50 x 50	717133	7977000	51	Slope / broad dune	E	0.5	Dry red sand	Excellent	N/A	Moderate (10-20)	BcGaCg	Fauna habitat 2
ELA64	4/03/21	50 x 50	716838	7977401	51	Flat / open depression / wetland	N/A	N/A	Water logged to inundated dark brown sand to clay	Excellent	Weeds	Old (>20)	CbEc	Fauna habitat 3

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Appendix G Floristic quadrat data and site photos

Quadrat	Species	Stratum	Lifeform	Cover (%)
ELA01	*Bauhinia cunninghamii*	U	Trees <10m	0.5
	Corymbia greeniana	U	Trees <10m	5
	Ehretia saligna	U	Trees <10m	0.2
	Erythrophleum chlorostachys	U	Trees <10m	2
	Acacia colei	M	Shrubs 1-2m	1.5
	Atalaya hemiglauca	M	Shrubs <1m	0.1
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.5
	Aristida holathera	G	Grasses	0.5
	Aristida hygrometrica	G	Grasses	0.2
	Chrysopogon fallax	G	Grasses	1.5
	Eragrostis eriopoda	G	Grasses	3
	Sorghum plumosum	G	Grasses	2
	Triodia bitextura	G	Grasses	30
	Boerhavia coccinea	G	Herbs	0.05
	Cajanus marmoratus	G	Herbs	0.1
	Calandrinia strophiolata	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.1
	Gomphrena canescens	G	Herbs	0.1
	Phyllanthus maderaspatensis	G	Herbs	0.2
	Polygala tepperi	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.01
	Ptilotus calostachyus	G	Herbs	0.05
	Tephrosia remotiflora	G	Herbs	0.2
	Tinospora smilacina	G	Herbs	0.01
ELA02	*Corymbia greeniana*	U	Trees <10m	1
	Erythrophleum chlorostachys	U	Trees <10m	3
	Eucalyptus coolabah	U	Trees <10m	0.5
	Acacia colei	M	Shrubs 1-2m	1.5
	Acacia platycarpa	M	Shrubs 1-2m	0.1
	Grevillea pyramidalis	M	Shrubs 1-2m	0.2
	Grevillea wickhamii	M	Shrubs 1-2m	0.2
	Senna costata	M	Shrubs 1-2m	0.2
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.5
	Dolichandrone occidentalis	M	Shrubs <1m	0.5
	Indigofera colutea	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	0.1
	Aristida holathera	G	Grasses	2

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	Chrysopogon fallax	G	Grasses	2.5
	Sorghum plumosum	G	Grasses	0.5
	Triodia bitextura	G	Grasses	40
	Cajanus marmoratus	G	Herbs	0.05
	Calandrinia strophiolata	G	Herbs	0.01
	Drosera derbyensis	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.05
	Gomphrena canescens	G	Herbs	0.1
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Goodenia sp.	G	Herbs	0.01
	Peplidium muelleri	G	Herbs	0.02
	Phyllanthus maderaspatensis	G	Herbs	0.05
	Pluchea tetranthera	G	Herbs	0.1
	Polygala tepperi	G	Herbs	0.1
	Ptilotus calostachyus	G	Herbs	0.01
	Ptilotus corymbosus	G	Herbs	0.1
	Tinospora smilacina	G	Herbs	0.01
ELA03	*Adansonia gregorii*	U	Trees 10-20m	2
	Corymbia greeniana	U	Trees <10m	2
	Eucalyptus chlorophylla	U	Trees <10m	1.8
	Acacia colei	M	Shrubs >2m	3
	Acacia eriopoda	M	Shrubs >2m	5
	Carissa lanceolata	M	Shrubs 1-2m	2.5
	Grevillea pyramidalis	M	Shrubs 1-2m	0.5
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.3
	Aristida holathera	G	Grasses	6
	Sorghum plumosum	G	Grasses	15
	Triodia bitextura	G	Grasses	35
	Cyperus blakeanus	G	Sedges	0.1
	Cassytha filiformis	G	Herbs	0.1
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.05
	Gomphrena canescens	G	Herbs	0.1
	Pluchea tetranthera	G	Herbs	0.05
	Polycarpaea corymbosa	G	Herbs	0.02
	Polygala galeocephala	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.02
	Tinospora smilacina	G	Herbs	0.05
ELA04	*Acacia eriopoda*	U	Trees <10m	3
	Bauhinia cunninghamii	U	Trees <10m	0.5
	Corymbia greeniana	U	Trees <10m	0.5
	Acacia colei	M	Shrubs >2m	0.5

Quadrat	Species	Stratum	Lifeform	Cover (%)
	**Stylosanthes hamata*	M	Shrubs <1m	0.1
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.5
	Senna notabilis	M	Shrubs <1m	0.2
	Solanum quadriloculatum	M	Shrubs <1m	0.1
	Aristida holathera	G	Grasses	0.05
	Aristida hygrometrica	G	Grasses	0.1
	Aristida latifolia	G	Grasses	12
	Cynodon convergens	G	Grasses	0.5
	Panicum decompositum	G	Grasses	0.2
	Sorghum plumosum	G	Grasses	0.2
	Sporobolus australasicus	G	Grasses	0.05
	Boerhavia coccinea	G	Herbs	0.5
	Crotalaria cunninghamii	G	Herbs	0.05
	Euphorbia schultzii var. *comans*	G	Herbs	0.1
	Polycarpaea corymbosa	G	Herbs	0.05
	Polymeria ambigua	G	Herbs	0.01
	Portulaca digyna	G	Herbs	0.02
	Portulaca oleracea	G	Herbs	0.01
	Tephrosia rosea	G	Herbs	0.1
ELA05	*Adansonia gregorii*	U	Trees <10m	1
	Gyrocarpus americanus	U	Trees <10m	0.01
	Hakea arborescens	U	Trees <10m	1
	Hakea chordophylla	U	Trees <10m	0.8
	Acacia colei	M	Shrubs >2m	3
	Grevillea pyramidalis	M	Shrubs 1-2m	0.02
	**Stylosanthes hamata*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.2
	Carissa lanceolata	M	Shrubs <1m	0.02
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.01
	Cullen badocanum	M	Shrubs <1m	0.01
	Dolichandrone occidentalis	M	Shrubs <1m	0.04
	Gossypium australe	M	Shrubs <1m	0.1
	Indigofera linnaei	M	Shrubs <1m	0.01
	Senna notabilis	M	Shrubs <1m	0.01
	Cynodon convergens	G	Grasses	0.01
	Eriachne obtusa	G	Grasses	0.02
	Poaceae sp. 1 (sterile)	G	Grasses	0.01
	Sorghum plumosum	G	Grasses	70
	Sporobolus australasicus	G	Grasses	0.01
	Triodia intermedia	G	Grasses	2
	Bonamia linearis	G	Herbs	0.01

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	Buchnera asperata	G	Herbs	0.01
	Buchnera ramosissima	G	Herbs	0.01
	Crotalaria ramosissima	G	Herbs	0.02
	Euphorbia schultzii var. *comans*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	1.5
	Goodenia armitiana	G	Herbs	0.01
	Goodenia sepalosa var. sepalosa	G	Herbs	0.01
	Heliotropium sp.	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01
	Trigastrotheca molluginea	G	Herbs	0.01
	Zornia sp.	G	Herbs	0.01
ELA06	*Eucalyptus chlorophylla*	U	Trees 10-20m	10
	Adansonia gregorii	U	Trees <10m	0.01
	Corymbia greeniana	U	Trees <10m	3
	Hakea chordophylla	U	Trees <10m	0.1
	Hakea macrocarpa	U	Trees <10m	0.05
	Acacia colei	M	Shrubs >2m	5
	Dolichandrone occidentalis	M	Shrubs 1-2m	1.5
	Grevillea pyramidalis	M	Shrubs 1-2m	0.01
	**Stylosanthes hamata*	M	Shrubs <1m	1
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.05
	Indigofera linnaei	M	Shrubs <1m	0.05
	Aristida holathera	G	Grasses	0.05
	Eriachne obtusa	G	Grasses	0.05
	Sorghum plumosum	G	Grasses	50
	Bonamia linearis	G	Herbs	0.01
	Buchnera asperata	G	Herbs	0.01
	Buchnera ramosissima	G	Herbs	0.01
	Cajanus marmoratus	G	Herbs	0.01
	Crotalaria ramosissima	G	Herbs	0.04
	Euphorbia schultzii var. *comans*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.5
	Goodenia armitiana	G	Herbs	0.01
	Mitrasacme exserta	G	Herbs	0.01
	Striga curviflora	G	Herbs	0.01
	Tephrosia leptoclada	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.05
	Zornia prostrata var. *prostrata*	G	Herbs	0.01
ELA07	*Corymbia greeniana*	U	Trees 10-20m	4
	Eucalyptus coolabah	U	Trees 10-20m	8
	Adansonia gregorii	U	Trees <10m	0.01

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Bauhinia cunninghamii	U	Trees <10m	3
	Ehretia saligna	U	Trees <10m	0.02
	Hakea chordophylla	U	Trees <10m	0.05
	Hakea macrocarpa	U	Trees <10m	0.05
	Acacia colei	M	Shrubs >2m	6
	Acacia ancistrocarpa	M	Shrubs 1-2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	0.2
	Flueggea virosa subsp. *melanthesoides*	M	Shrubs 1-2m	0.05
	Gossypium australe	M	Shrubs 1-2m	0.05
	**Stylosanthes hamata*	M	Shrubs <1m	1
	Abutilon sp.	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.01
	Dolichandrone occidentalis	M	Shrubs <1m	0.01
	Waltheria indica	M	Shrubs <1m	0.01
	Aristida hygrometrica	G	Grasses	0.5
	Chrysopogon fallax	G	Grasses	4
	Eriachne obtusa	G	Grasses	2
	Eulalia aurea	G	Grasses	4
	Panicum decompositum	G	Grasses	0.01
	Poaceae sp. 2 (sterile)	G	Grasses	1
	Sorghum plumosum	G	Grasses	2
	Sporobolus australasicus	G	Grasses	0.02
	Triodia intermedia	G	Grasses	1
	**Melochia pyramidata*	G	Herbs	0.01
	Alternanthera angustifolia	G	Herbs	0.01
	Alternanthera nana	G	Herbs	0.01
	Blumea tenella	G	Herbs	0.01
	Bonamia linearis	G	Herbs	0.01
	Buchnera asperata	G	Herbs	0.01
	Crotalaria ramosissima	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.5
	Goodenia armitiana	G	Herbs	0.01
	Peplidium muelleri	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.04
	Pluchea tetranthera	G	Herbs	0.5
	Stemodia lathraia	G	Herbs	0.01
	Zornia prostrata var. *prostrata*	G	Herbs	0.01
ELA08	*Adansonia gregorii*	U	Trees <10m	0.01
	Corymbia greeniana	U	Trees <10m	1.5
	Eucalyptus chlorophylla	U	Trees <10m	2

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Hakea arborescens	U	Trees <10m	2.5
	Hakea chordophylla	U	Trees <10m	0.2
	Hakea macrocarpa	U	Trees <10m	0.1
	Acacia colei	M	Shrubs >2m	3
	Atalaya hemiglauca	M	Shrubs 1-2m	0.01
	Carissa lanceolata	M	Shrubs 1-2m	0.04
	**Stylosanthes hamata*	M	Shrubs <1m	1
	Gossypium australe	M	Shrubs <1m	0.05
	Indigofera linifolia	M	Shrubs <1m	0.01
	Indigofera linnaei	M	Shrubs <1m	0.05
	Eriachne obtusa	G	Grasses	40
	Sorghum plumosum	G	Grasses	20
	Sporobolus australasicus	G	Grasses	0.01
	Fimbristylis schultzii	G	Sedges	0.01
	Buchnera asperata	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.5
	Goodenia armitiana	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Peplidium muelleri	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.02
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.01
	Zornia prostrata var. *prostrata*	G	Herbs	0.02
ELA09	*Eucalyptus microtheca*	U	Trees 10-20m	5
	Bauhinia cunninghamii	U	Trees <10m	10
	Acacia colei	M	Shrubs 1-2m	2
	Carissa lanceolata	M	Shrubs 1-2m	1.5
	Corchorus fascicularis	M	Shrubs <1m	10
	Corchorus sidoides subsp. vermicularis	M	Shrubs <1m	0.3
	Hibiscus austrinus	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	15
	Malvaceae sp.	M	Shrubs <1m	0.1
	Senna notabilis	M	Shrubs <1m	0.1
	Aristida latifolia	G	Grasses	1.5
	Sehima nervosum	G	Grasses	0.5
	Sporobolus australasicus	G	Grasses	0.5
	Boerhavia coccinea	G	Herbs	0.2
	Crotalaria cunninghamii	G	Herbs	0.2
	Crotalaria montana var. *angustifolia*	G	Herbs	0.1
	Cucumis picriocarpus	G	Herbs	0.1
	Phyllanthus maderaspatensis	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.5

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Portulaca oligosperma	G	Herbs	0.05
	Spermacoce occidentalis	G	Herbs	0.1
ELA10	*Adansonia gregorii*	U	Trees 10-20m	5
	Eucalyptus microtheca	U	Trees 10-20m	8
	Atalaya hemiglauca	U	Trees <10m	10
	Eucalyptus camaldulensis	U	Trees <10m	15
	Terminalia platyphylla	U	Trees <10m	40
	**Vachellia farnesiana*	M	Shrubs >2m	2
	Acacia colei	M	Shrubs >2m	0.4
	Indigofera colutea	M	Shrubs <1m	0.05
	Malvaceae sp.	M	Shrubs <1m	0.2
	Sida fibulifera	M	Shrubs <1m	0.2
	Aristida latifolia	G	Grasses	2
	Sehima nervosum	G	Grasses	4
	Sporobolus australasicus	G	Grasses	0.2
	**Malvastrum americanum*	G	Herbs	0.5
	Afrohybanthus enneaspermus	G	Herbs	0.2
	Boerhavia coccinea	G	Herbs	0.1
	Cardiospermum halicacabum var. *halicacabum*	G	Herbs	0.1
	Ipomoea costata	G	Herbs	0.1
	Phyllanthus maderaspatensis	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.1
	Rostellularia adscendens var. *clementii*	G	Herbs	0.01
	Spermacoce occidentalis	G	Herbs	0.1
ELA11	*Eucalyptus camaldulensis*	U	Trees 10-20m	4
	Adansonia gregorii	U	Trees <10m	1.8
	Bauhinia cunninghamii	U	Trees <10m	1
	Eucalyptus microtheca	U	Trees <10m	8
	Hakea arborescens	U	Trees <10m	0.1
	Terminalia platyphylla	U	Trees <10m	40
	Acacia colei	M	Shrubs >2m	1.5
	Santalum lanceolatum	M	Shrubs >2m	1
	**Vachellia farnesiana*	M	Shrubs 1-2m	0.2
	Atalaya hemiglauca	M	Shrubs 1-2m	0.8
	Carissa lanceolata	M	Shrubs 1-2m	0.05
	Corchorus fascicularis	M	Shrubs <1m	0.02
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.01
	Malvaceae sp.	M	Shrubs <1m	0.01
	Rostellularia adscendens var. *clementii*	M	Shrubs <1m	0.01
	Aristida latifolia	G	Grasses	15
	Cynodon convergens	G	Grasses	0.01

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	Sehima nervosum	G	Grasses	0.04
	Urochloa occidentalis var. *occidentalis*	G	Grasses	0.01
	Cyperaceae sp.	G	Sedges	0.05
	Boerhavia coccinea	G	Herbs	0.02
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.02
	Spermacoce occidentalis	G	Herbs	0.01
ELA12	*Adansonia gregorii*	U	Trees <10m	3
	Bauhinia cunninghamii	U	Trees <10m	1.2
	Corymbia greeniana	U	Trees <10m	1.5
	Eucalyptus microtheca	U	Trees <10m	6
	Eucalyptus tectifica	U	Trees <10m	6
	Hakea arborescens	U	Trees <10m	0.8
	Terminalia platyphylla	U	Trees <10m	20
	Acacia colei	M	Shrubs >2m	1.5
	Atalaya hemiglauca	M	Shrubs 1-2m	0.04
	Carissa lanceolata	M	Shrubs 1-2m	0.04
	**Stylosanthes hamata*	M	Shrubs <1m	0.01
	**Vachellia farnesiana*	M	Shrubs <1m	0.02
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.02
	Gossypium australe	M	Shrubs <1m	0.01
	Malvaceae sp.	M	Shrubs <1m	0.01
	Aristida latifolia	G	Grasses	15
	Sehima nervosum	G	Grasses	0.04
	Boerhavia coccinea	G	Herbs	0.01
	Cardiospermum halicacabum var. *halicacabum*	G	Herbs	0.01
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Ipomoea plebeia	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.02
	Polymeria ambigua	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.01
	Rostellularia adscendens var. *clementii*	G	Herbs	0.01
	Spermacoce occidentalis	G	Herbs	0.01
	Zornia prostrata var. *prostrata*	G	Herbs	0.01
ELA13	*Corymbia bella*	U	Trees 10-20m	20
	Hakea arborescens	U	Trees <10m	2
	Acacia colei	M	Shrubs 1-2m	0.5

Quadrat	Species	Stratum	Lifeform	Cover (%)
	**Stylosanthes hamata*	M	Shrubs <1m	0.2
	Corchorus fascicularis	M	Shrubs <1m	0.3
	Dolichandrone occidentalis	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	0.5
	Indigofera linnaei	M	Shrubs <1m	0.2
	Aristida hygrometrica	G	Grasses	3
	Eragrostis exigua	G	Grasses	0.1
	Eriachne obtusa	G	Grasses	30
	Sorghum plumosum	G	Grasses	0.2
	Fimbristylis ferruginea	G	Sedges	0.1
	Boerhavia coccinea	G	Herbs	0.5
	Crotalaria montana var. *angustifolia*	G	Herbs	0.2
	Neptunia gracilis forma. *gracilis*	G	Herbs	0.2
	Peplidium muelleri	G	Herbs	0.3
	Phyllanthus maderaspatensis	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.05
	Portulaca oleracea	G	Herbs	0.01
	Spermacoce occidentalis	G	Herbs	0.01
ELA14	*Adansonia gregorii*	U	Trees 10-20m	15
	Eucalyptus coolabah	U	Trees 10-20m	5
	Corymbia greeniana	U	Trees <10m	1
	Hakea arborescens	U	Trees <10m	5
	Hakea chordophylla	U	Trees <10m	0.5
	Melaleuca alsophila	U	Trees <10m	2
	Grevillea pyramidalis	M	Shrubs >2m	0.2
	Acacia colei	M	Shrubs 1-2m	1.5
	Carissa lanceolata	M	Shrubs 1-2m	1
	**Stylosanthes hamata*	M	Shrubs <1m	2.5
	Gossypium australe	M	Shrubs <1m	0.01
	Indigofera linnaei	M	Shrubs <1m	0.2
	Aristida hygrometrica	G	Grasses	0.5
	Eriachne obtusa	G	Grasses	2
	Sorghum plumosum	G	Grasses	45
	Fimbristylis ferruginea	G	Sedges	0.1
	Alysicarpus muelleri	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.2
	Evolvulus alsinoides	G	Herbs	0.05
	Gomphrena canescens	G	Herbs	0.05
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.01
	Polygala galeocephala	G	Herbs	0.1

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	Polymeria ambigua	G	Herbs	0.1
	Pterocaulon sp.	G	Herbs	0.01
	Tinospora smilacina	G	Herbs	0.01
ELA15	*Adansonia gregorii*	U	Trees 10-20m	5
	Corymbia greeniana	U	Trees <10m	2
	Hakea arborescens	U	Trees <10m	8
	Melaleuca alsophila	U	Trees <10m	10
	Acacia colei	M	Shrubs >2m	3
	Aristida hygrometrica	G	Grasses	1
	Eriachne obtusa	G	Grasses	10
	Panicum decompositum	G	Grasses	0.1
	Sorghum plumosum	G	Grasses	20
	Fimbristylis ferruginea	G	Sedges	5
	Crotalaria montana var. *angustifolia*	G	Herbs	0.01
	Murdannia graminea	G	Herbs	0.01
	Portulaca digyna	G	Herbs	0.01
	Trianthema pilosum	G	Herbs	0.01
ELA16	*Adansonia gregorii*	U	Trees 10-20m	1.5
	Corymbia greeniana	U	Trees 10-20m	3.5
	Bauhinia cunninghamii	U	Trees <10m	0.8
	Hakea arborescens	U	Trees <10m	1
	Acacia colei	M	Shrubs >2m	0.4
	Grevillea pyramidalis	M	Shrubs >2m	0.2
	Carissa lanceolata	M	Shrubs 1-2m	0.5
	Gossypium australe	M	Shrubs 1-2m	0.01
	Cullen corallum	M	Shrubs <1m	0.01
	Eriachne obtusa	G	Grasses	0.5
	Sorghum plumosum	G	Grasses	60
	Bonamia linearis	G	Herbs	0.1
	Gomphrena canescens	G	Herbs	0.02
	Goodenia armitiana	G	Herbs	0.01
	Peplidium muelleri	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.01
ELA17	*Corymbia greeniana*	U	Trees <10m	2
	Gyrocarpus americanus	U	Trees <10m	0.05
	Acacia platycarpa	M	Shrubs >2m	6
	Grevillea pyramidalis	M	Shrubs 1-2m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.01
	Aristida latifolia	G	Grasses	0.1
	Eriachne obtusa	G	Grasses	0.5
	Panicum decompositum	G	Grasses	0.01

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Sorghum plumosum	G	Grasses	70
	Triodia sp.	G	Grasses	0.5
	Bonamia linearis	G	Herbs	0.7
	Bonamia pannosa	G	Herbs	0.01
	Crotalaria ramosissima	G	Herbs	0.01
	Cucumis melo	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.02
	Polymeria ambigua	G	Herbs	0.01
ELA18	*Corymbia zygophylla*	U	Trees 10-20m	4
	Acacia platycarpa	M	Shrubs >2m	6
	Chamaecrista symonii	M	Shrubs <1m	0.7
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.02
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.01
	Grevillea pyramidalis	M	Shrubs <1m	0.01
	Waltheria indica	M	Shrubs <1m	0.02
	?*Austrostipa* sp.	G	Grasses	6
	Aristida latifolia	G	Grasses	8
	Eriachne obtusa	G	Grasses	0.5
	Sorghum plumosum	G	Grasses	15
	Bonamia pannosa	G	Herbs	0.8
	Gomphrena canescens	G	Herbs	0.01
	Ptilotus calostachyus	G	Herbs	0.01
	Spermacoce occidentalis	G	Herbs	0.04
ELA19	*Adansonia gregorii*	U	Trees 10-20m	1
	Atalaya hemiglauca	U	Trees <10m	0.02
	Bauhinia cunninghamii	U	Trees <10m	1
	Hakea arborescens	U	Trees <10m	0.5
	Acacia ancistrocarpa	M	Shrubs >2m	2
	Acacia colei	M	Shrubs 1-2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	0.04
	Grevillea pyramidalis	M	Shrubs 1-2m	0.1
	**Stylosanthes hamata*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.01
	Dolichandrone occidentalis	M	Shrubs <1m	0.04
	Gossypium australe	M	Shrubs <1m	0.1
	Indigofera colutea	M	Shrubs <1m	0.02
	Indigofera linifolia	M	Shrubs <1m	0.01
	Indigofera linnaei	M	Shrubs <1m	0.01
	Aristida hygrometrica	G	Grasses	0.1
	Enneapogon purpurascens	G	Grasses	0.2

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Eriachne obtusa	G	Grasses	0.05
	Sorghum plumosum	G	Grasses	40
	Boerhavia coccinea	G	Herbs	0.02
	Cajanus marmoratus	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.5
	Gomphrena canescens	G	Herbs	0.02
	Pluchea tetranthera	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.01
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.01
	Ptilotus corymbosus	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01
ELA20	*Bauhinia cunninghamii*	U	Trees <10m	1
	Gyrocarpus americanus	U	Trees <10m	0.01
	Terminalia platyphylla	U	Trees <10m	0.01
	Acacia platycarpa	M	Shrubs >2m	5
	Grevillea pyramidalis	M	Shrubs >2m	0.05
	Atalaya hemiglauca	M	Shrubs 1-2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	0.5
	**Calotropis procera*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.05
	Aristida latifolia	G	Grasses	0.1
	Chrysopogon fallax	G	Grasses	8
	Enneapogon pallidus	G	Grasses	0.1
	Eriachne obtusa	G	Grasses	0.5
	Sorghum plumosum	G	Grasses	8
	Sorghum stipoideum	G	Grasses	0.05
	Triodia sp.	G	Grasses	0.05
	Alternanthera angustifolia	G	Herbs	0.01
	Crotalaria ramosissima	G	Herbs	0.01
	Evolvulus alsinoides	G	Herbs	0.01
	Tinospora smilacina	G	Herbs	0.02
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01
ELA21	*Bauhinia cunninghamii*	U	Trees <10m	0.05
	Hakea macrocarpa	U	Trees <10m	0.1
	Acacia ancistrocarpa	M	Shrubs >2m	0.1
	Acacia colei	M	Shrubs >2m	10
	Grevillea pyramidalis	M	Shrubs >2m	0.8
	**Stylosanthes hamata*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.01
	Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	M	Shrubs <1m	0.01

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Cullen badocanum	M	Shrubs <1m	0.01
	Gossypium australe	M	Shrubs <1m	0.05
	Indigofera colutea	M	Shrubs <1m	0.01
	Indigofera linifolia	M	Shrubs <1m	0.01
	Eriachne obtusa	G	Grasses	0.02
	Sehima nervosum	G	Grasses	35
	Bergia trimera	G	Herbs	0.2
	Cajanus marmoratus	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.02
	Gomphrena canescens	G	Herbs	0.01
	Ipomoea eriocarpa	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.02
	Ptilotus corymbosus	G	Herbs	0.01
ELA22	*Bauhinia cunninghamii*	U	Trees <10m	0.4
	Corymbia greeniana	U	Trees <10m	0.2
	Hakea arborescens	U	Trees <10m	0.2
	Hakea chordophylla	U	Trees <10m	0.1
	Acacia ancistrocarpa	M	Shrubs >2m	2
	Acacia colei	M	Shrubs >2m	3
	Grevillea pyramidalis	M	Shrubs 1-2m	0.5
	Cullen badocanum	M	Shrubs <1m	0.01
	Aristida latifolia	G	Grasses	15
	Eriachne obtusa	G	Grasses	0.1
	Sorghum plumosum	G	Grasses	25
	Evolvulus alsinoides	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.1
	Goodenia armitiana	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01
ELA23	*Corymbia greeniana*	U	Trees <10m	0.1
	Dolichandrone occidentalis	U	Trees <10m	0.04
	Hakea macrocarpa	U	Trees <10m	0.7
	Terminalia canescens	U	Trees <10m	0.15
	Acacia ancistrocarpa	M	Shrubs >2m	5
	Acacia colei	M	Shrubs >2m	0.1
	Grevillea pyramidalis	M	Shrubs >2m	0.8
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.02
	Eragrostis eriopoda	G	Grasses	0.05
	Sorghum plumosum	G	Grasses	45
	Triodia intermedia	G	Grasses	2
	Arivela viscosa	G	Herbs	0.02

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Cajanus marmoratus	G	Herbs	0.01
	Crotalaria brevis	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
	Heliotropium diversifolium	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.01
	Polygala galeocephala	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.01
	Striga curviflora	G	Herbs	0.01
ELA24	*Adansonia gregorii*	U	Trees 10-20m	6
	Bauhinia cunninghamii	U	Trees <10m	1
	Corymbia greeniana	U	Trees <10m	0.1
	Hakea arborescens	U	Trees <10m	0.05
	Hakea macrocarpa	U	Trees <10m	1.2
	Terminalia canescens	U	Trees <10m	7
	Acacia ancistrocarpa	M	Shrubs >2m	0.4
	Grevillea pyramidalis	M	Shrubs >2m	0.1
	Acacia colei	M	Shrubs 1-2m	1
	Atalaya hemiglauca	M	Shrubs 1-2m	0.06
	Carissa lanceolata	M	Shrubs 1-2m	0.08
	Clerodendrum ?floribundum	M	Shrubs 1-2m	0.05
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.01
	Gossypium australe	M	Shrubs <1m	0.01
	Indigofera linifolia	M	Shrubs <1m	0.01
	Eragrostis eriopoda	G	Grasses	0.02
	Sehima nervosum	G	Grasses	0.4
	Sorghum plumosum	G	Grasses	45
	Triodia intermedia	G	Grasses	3
	**Portulaca pilosa*	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.01
	Cajanus marmoratus	G	Herbs	0.01
	Crotalaria brevis	G	Herbs	0.01
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.01
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.01
	Evolvulus alsinoides var. *villosicalyx*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.02
	Heliotropium diversifolium	G	Herbs	0.01
	Heliotropium foliatum	G	Herbs	0.01
	Mitrasacme exserta	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.02

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Pluchea tetranthera	G	Herbs	0.02
	Polygala tepperi	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.01
	Scleromitrion scleranthoides	G	Herbs	0.01
	Zornia prostrata var. prostrata	G	Herbs	0.01
ELA25	*Bauhinia cunninghamii*	U	Trees <10m	0.08
	Hakea macrocarpa	U	Trees <10m	1
	Grevillea pyramidalis	M	Shrubs >2m	0.1
	Acacia colei	M	Shrubs 1-2m	0.05
	Atalaya hemiglauca	M	Shrubs 1-2m	0.05
	Carissa lanceolata	M	Shrubs <1m	0.08
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.01
	Gossypium australe	M	Shrubs <1m	0.03
	Indigofera colutea	M	Shrubs <1m	0.02
	Aristida latifolia	G	Grasses	0.02
	Sehima nervosum	G	Grasses	0.02
	Sorghum plumosum	G	Grasses	90
	Sporobolus australasicus	G	Grasses	0.01
	Triodia intermedia	G	Grasses	1.5
	**Portulaca pilosa*	G	Herbs	0.01
	Bergia henshallii	G	Herbs	0.02
	Boerhavia coccinea	G	Herbs	0.01
	Cajanus marmoratus	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.02
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
	Heliotropium diversifolium	G	Herbs	0.01
	Neptunia gracilis forma. *gracilis*	G	Herbs	0.02
	Pluchea tetranthera	G	Herbs	0.5
	Polygala galeocephala	G	Herbs	0.01
	Polygala tepperi	G	Herbs	0.02
	Polymeria ambigua	G	Herbs	0.01
	Pterocaulon intermedium	G	Herbs	0.04
	Rhynchosia minima	G	Herbs	0.01
	Tinospora smilacina	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.05
ELA26	*Bauhinia cunninghamii*	U	Trees <10m	1
	Hakea chordophylla	U	Trees <10m	2
	Hakea macrocarpa	U	Trees <10m	1
	Terminalia canescens	U	Trees <10m	10

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Acacia ancistrocarpa	M	Shrubs 1-2m	0.5
	Dolichandrone occidentalis	M	Shrubs 1-2m	0.5
	Grevillea pyramidalis	M	Shrubs 1-2m	0.5
	**Stylosanthes hamata*	M	Shrubs <1m	0.2
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.1
	Gossypium australe	M	Shrubs <1m	0.1
	Indigofera colutea	M	Shrubs <1m	0.5
	Indigofera linnaei	M	Shrubs <1m	0.2
	Eriachne obtusa	G	Grasses	0.2
	Eulalia aurea	G	Grasses	0.3
	Sorghum plumosum	G	Grasses	60
	Sporobolus australasicus	G	Grasses	0.5
	Triodia intermedia	G	Grasses	5
	Alysicarpus muelleri	G	Herbs	0.01
	Arivela tetrandra	G	Herbs	0.01
	Byblis filifolia	G	Herbs	0.02
	Glycine tomentella	G	Herbs	0.05
	Gomphrena brachystylis subsp. *pindanensis*	G	Herbs	1
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.02
	Heliotropium cunninghamii	G	Herbs	0.1
	Heliotropium foliatum	G	Herbs	0.01
	Lindernia clausa	G	Herbs	0.01
	Mitrasacme exserta	G	Herbs	0.01
	Mitrasacme hispida	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.02
	Pluchea tetranthera	G	Herbs	0.1
	Polygala galeocephala	G	Herbs	0.01
	Ptilotus corymbosus	G	Herbs	0.01
	Ptilotus fusiformis	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.1
	Spermacoce occidentalis	G	Herbs	0.01
ELA27	*Terminalia canescens*	U	Trees <10m	5
	Acacia ancistrocarpa	M	Shrubs >2m	10
	Grevillea pyramidalis	M	Shrubs >2m	0.2
	Acacia colei	M	Shrubs 1-2m	0.2
	**Stylosanthes hamata*	M	Shrubs <1m	0.1
	Corchorus fascicularis	M	Shrubs <1m	0.05
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.5
	Gossypium australe	M	Shrubs <1m	0.1
	Indigofera linnaei	M	Shrubs <1m	0.1
	Senna notabilis	M	Shrubs <1m	0.05

Quadrat	Species	Stratum	Lifeform	Cover (%)
	**Cenchrus setiger*	G	Grasses	0.1
	Aristida holathera	G	Grasses	0.5
	Eragrostis eriopoda	G	Grasses	0.2
	Perotis rara	G	Grasses	0.05
	Sorghum plumosum	G	Grasses	15
	Sporobolus australasicus	G	Grasses	0.1
	Triodia bitextura	G	Grasses	4
	Triodia intermedia	G	Grasses	0.5
	**Portulaca pilosa*	G	Herbs	0.01
	Alysicarpus muelleri	G	Herbs	0.02
	Arivela tetrandra	G	Herbs	0.01
	Arivela viscosa	G	Herbs	0.01
	Buchnera ramosissima	G	Herbs	0.2
	Drosera derbyensis	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.01
	Gomphrena brachystylis subsp. *pindanensis*	G	Herbs	1
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.05
	Lindernia clausa	G	Herbs	0.01
	Mitrasacme exserta	G	Herbs	0.01
	Mitrasacme hispida	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.3
	Pluchea tetranthera	G	Herbs	0.5
	Pterocaulon sp.	G	Herbs	0.01
	Ptilotus corymbosus	G	Herbs	0.05
	Spermacoce occidentalis	G	Herbs	0.01
	Stackhousia intermedia	G	Herbs	0.01
	Trianthema pilosum	G	Herbs	0.01
ELA28	*Acacia colei*	U	Trees <10m	12
	Atalaya hemiglauca	U	Trees <10m	0.2
	Bauhinia cunninghamii	U	Trees <10m	0.5
	Hakea macrocarpa	U	Trees <10m	0.5
	Terminalia canescens	U	Trees <10m	8
	Grevillea pyramidalis	M	Shrubs >2m	0.5
	**Stylosanthes hamata*	M	Shrubs <1m	0.5
	Abutilon hannii	M	Shrubs <1m	0.1
	Carissa lanceolata	M	Shrubs <1m	0.4
	Corchorus fascicularis	M	Shrubs <1m	0.01
	Gossypium australe	M	Shrubs <1m	0.1
	Indigofera colutea	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	0.1
	Indigofera linnaei	M	Shrubs <1m	0.8

Quadrat	Species	Stratum	Lifeform	Cover (%)
	**Cenchrus setiger*	G	Grasses	0.1
	Dactyloctenium radulans	G	Grasses	0.1
	Eriachne obtusa	G	Grasses	4
	Panicum decompositum	G	Grasses	0.1
	Perotis rara	G	Grasses	0.5
	Sehima nervosum	G	Grasses	0.5
	Sorghum plumosum	G	Grasses	30
	Sporobolus australasicus	G	Grasses	0.2
	Triodia intermedia	G	Grasses	10
	**Portulaca pilosa*	G	Herbs	0.01
	Alysicarpus muelleri	G	Herbs	0.05
	Boerhavia coccinea	G	Herbs	0.05
	Crotalaria brevis	G	Herbs	0.01
	Evolvulus alsinoides	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.02
	Heliotropium cunninghamii	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.02
	Pluchea tetranthera	G	Herbs	0.1
	Polycarpaea corymbosa	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.2
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.01
	Ptilotus corymbosus	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.1
	Spermacoce occidentalis	G	Herbs	0.1
ELA29	*Adansonia gregorii*	U	Trees <10m	0.5
	Atalaya hemiglauca	U	Trees <10m	0.5
	Bauhinia cunninghamii	U	Trees <10m	2
	Hakea arborescens	U	Trees <10m	0.5
	Hakea macrocarpa	U	Trees <10m	0.3
	Grevillea pyramidalis	M	Shrubs >2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	0.2
	Dolichandrone occidentalis	M	Shrubs 1-2m	0.5
	Gossypium australe	M	Shrubs 1-2m	0.1
	**Stylosanthes hamata*	M	Shrubs <1m	0.2
	Abutilon hannii	M	Shrubs <1m	0.2
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.5
	Gymnanthera oblonga	M	Shrubs <1m	0.01
	Indigofera colutea	M	Shrubs <1m	0.5
	Indigofera linifolia	M	Shrubs <1m	0.1
	Aristida hygrometrica	G	Grasses	0.5

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Eriachne obtusa	G	Grasses	0.02
	Sorghum plumosum	G	Grasses	0.5
	Triodia intermedia	G	Grasses	30
	**Portulaca pilosa*	G	Herbs	0.01
	Afrohybanthus enneaspermus	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.1
	Buchnera ramosissima	G	Herbs	0.1
	Cajanus latisepalus	G	Herbs	2
	Crotalaria cunninghamii	G	Herbs	0.05
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.1
	Cucumis variabilis	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.1
	Mitrasacme exserta	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.5
	Polygala galeocephala	G	Herbs	0.01
	Pterocaulon intermedium	G	Herbs	0.1
	Spermacoce occidentalis	G	Herbs	0.01
	Stackhousia intermedia	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.05
ELA30	*Adansonia gregorii*	U	Trees 10-20m	0.01
	Bauhinia cunninghamii	U	Trees <10m	0.1
	Ehretia saligna	U	Trees <10m	0.7
	Hakea arborescens	U	Trees <10m	0.3
	Hakea chordophylla	U	Trees <10m	0.05
	Hakea macrocarpa	U	Trees <10m	0.05
	Atalaya hemiglauca	M	Shrubs 1-2m	0.05
	Carissa lanceolata	M	Shrubs 1-2m	0.2
	Gossypium australe	M	Shrubs 1-2m	0.1
	Grevillea pyramidalis	M	Shrubs 1-2m	0.03
	Abutilon hannii	M	Shrubs <1m	0.05
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.01
	Cullen badocanum	M	Shrubs <1m	0.01
	Indigofera colutea	M	Shrubs <1m	0.02
	Indigofera linifolia	M	Shrubs <1m	0.01
	Eriachne obtusa	G	Grasses	0.7
	Sorghum plumosum	G	Grasses	90
	Triodia intermedia	G	Grasses	0.1
	Cyperus blakeanus	G	Sedges	1
	Amaranthus undulatus	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.05

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Buchnera ramosissima	G	Herbs	0.01
	Cajanus marmoratus	G	Herbs	0.02
	Crotalaria ramosissima	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
	Goodenia armitiana	G	Herbs	0.01
	Mitrasacme exserta	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.01
	Pterocaulon intermedium	G	Herbs	0.4
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01
	Zornia chaetophora	G	Herbs	0.01
	Zornia prostrata var. *prostrata*	G	Herbs	0.01
ELA31	*Adansonia gregorii*	U	Trees <10m	2
	Bauhinia cunninghamii	U	Trees <10m	0.5
	Hakea arborescens	U	Trees <10m	0.1
	Terminalia canescens	U	Trees <10m	0.5
	Grevillea pyramidalis	M	Shrubs >2m	0.5
	Acacia ancistrocarpa	M	Shrubs 1-2m	0.5
	Acacia colei	M	Shrubs 1-2m	0.05
	Carissa lanceolata	M	Shrubs 1-2m	0.2
	**Stylosanthes hamata*	M	Shrubs <1m	0.5
	Corchorus fascicularis	M	Shrubs <1m	0.1
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.2
	Gossypium australe	M	Shrubs <1m	0.2
	Indigofera colutea	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	0.1
	Indigofera linnaei	M	Shrubs <1m	0.5
	Aristida holathera	G	Grasses	0.5
	Aristida hygrometrica	G	Grasses	0.1
	Aristida latifolia	G	Grasses	0.2
	Chrysopogon fallax	G	Grasses	0.1
	Cymbopogon ambiguus	G	Grasses	1
	Eriachne obtusa	G	Grasses	0.2
	Panicum decompositum	G	Grasses	0.1
	Sorghum plumosum	G	Grasses	3
	Sporobolus australasicus	G	Grasses	0.2
	Triodia intermedia	G	Grasses	10
	Urochloa holosericea	G	Grasses	1.5
	Fimbristylis schultzii	G	Sedges	0.1

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	**Portulaca pilosa*	G	Herbs	0.01
	Afrohybanthus enneaspermus	G	Herbs	0.05
	Arivela viscosa	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.2
	Buchnera ramosissima	G	Herbs	0.3
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.2
	Euphorbia psilosperma	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Lindernia clausa	G	Herbs	0.05
	Neptunia gracilis forma. *gracilis*	G	Herbs	0.5
	Phyllanthus maderaspatensis	G	Herbs	0.05
	Pluchea tetranthera	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.1
	Portulaca digyna	G	Herbs	0.01
	Portulaca oleracea	G	Herbs	0.01
	Pterocaulon intermedium	G	Herbs	0.01
	Ptilotus fusiformis	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.1
	Roepera sp.	G	Herbs	0.01
	Spermacoce occidentalis	G	Herbs	0.1
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.1
	Zornia prostrata var. *prostrata*	G	Herbs	0.02
	Acacia colei	M	Shrubs 1-2m	0.04
	Abutilon otocarpum	M	Shrubs <1m	0.02
	Atalaya hemiglauca	M	Shrubs <1m	0.1
	Carissa lanceolata	M	Shrubs <1m	0.05
	Chamaecrista symonii	M	Shrubs <1m	1
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.01
	Gossypium australe	M	Shrubs <1m	0.05
	Indigofera linifolia	M	Shrubs <1m	0.01
	Indigofera linnaei	M	Shrubs <1m	0.01
ELA32	*Eriachne obtusa*	G	Grasses	0.05
	Panicum decompositum	G	Grasses	0.01
	Perotis rara	G	Grasses	0.1
	Sporobolus australasicus	G	Grasses	0.05
	Triodia wiseana	G	Grasses	90
	Arivela viscosa	G	Herbs	0.01
	Blumea integrifolia	G	Herbs	0.01
	Blumea tenella	G	Herbs	0.4
	Cajanus marmoratus	G	Herbs	0.02
	Evolvulus alsinoides	G	Herbs	0.01

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Gomphrena canescens	G	Herbs	0.01
	Ipomoea coptica	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.05
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01
ELA33	*Adansonia gregorii*	U	Trees <10m	0.5
	Hakea arborescens	U	Trees <10m	1.5
	Hakea chordophylla	U	Trees <10m	2
	Terminalia canescens	U	Trees <10m	2
	Atalaya hemiglauca	M	Shrubs 1-2m	0.2
	Carissa lanceolata	M	Shrubs 1-2m	0.2
	**Calotropis procera*	M	Shrubs <1m	0.05
	Corchorus fascicularis	M	Shrubs <1m	0.1
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.1
	Gossypium australe	M	Shrubs <1m	0.1
	Indigofera colutea	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	0.5
	Indigofera linnaei	M	Shrubs <1m	0.1
	Pimelea punicea	M	Shrubs <1m	0.05
	Aristida holathera	G	Grasses	0.5
	Cymbopogon ambiguus	G	Grasses	0.05
	Eriachne helmsii	G	Grasses	0.1
	Perotis rara	G	Grasses	0.05
	Sorghum plumosum	G	Grasses	0.5
	Sporobolus australasicus	G	Grasses	0.2
	Triodia intermedia	G	Grasses	0.5
	Urochloa holosericea	G	Grasses	0.5
	Afrohybanthus enneaspermus	G	Herbs	0.05
	Arivela viscosa	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.5
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.5
	Euphorbia cinerea	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.1
	Gomphrena brachystylis subsp. *pindanensis*	G	Herbs	0.5
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.05
	Heliotropium cunninghamii	G	Herbs	0.05
	Mitrasacme exserta	G	Herbs	0.01
	Neptunia gracilis forma. *gracilis*	G	Herbs	0.5
	Pluchea tetranthera	G	Herbs	0.1
	Polycarpaea holtzei	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.1

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Portulaca digyna	G	Herbs	0.01
	Portulaca oleracea	G	Herbs	0.02
	Pterocaulon intermedium	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.2
	Spermacoce occidentalis	G	Herbs	0.02
	Stackhousia intermedia	G	Herbs	0.2
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.1
ELA34	*Adansonia gregorii*	U	Trees 10-20m	0.01
	**Stylosanthes hamata*	M	Shrubs <1m	0.01
	Chamaecrista symonii	M	Shrubs <1m	0.1
	Dolichandrone occidentalis	M	Shrubs <1m	0.1
	Grona filiformis	M	Shrubs <1m	0.01
	Indigofera linifolia	M	Shrubs <1m	0.01
	Indigofera linnaei	M	Shrubs <1m	0.01
	Aristida latifolia	G	Grasses	0.1
	Dactyloctenium radulans	G	Grasses	0.01
	Eragrostis tenellula	G	Grasses	0.02
	Eriachne obtusa	G	Grasses	0.05
	Panicum decompositum	G	Grasses	0.02
	Sorghum plumosum	G	Grasses	30
	Triodia intermedia	G	Grasses	30
	Xerochloa barbata	G	Grasses	0.01
	Fimbristylis schultzii	G	Sedges	0.01
	**Portulaca pilosa*	G	Herbs	0.01
	Arivela viscosa	G	Herbs	0.01
	Blumea integrifolia	G	Herbs	0.01
	Buchnera asperata	G	Herbs	0.01
	Calandrinia tepperiana	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.05
	Crotalaria ramosissima	G	Herbs	0.02
	Evolvulus alsinoides	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.5
	Ipomoea coptica	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.04
	Spermacoce occidentalis	G	Herbs	0.01
	Trianthema oxycalyptrum var. *oxycalyptrum*	G	Herbs	0.01
ELA35	**Calotropis procera*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.01
	Chamaecrista symonii	M	Shrubs <1m	0.6
	Dolichandrone occidentalis	M	Shrubs <1m	0.02

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Gossypium australe	M	Shrubs <1m	0.01
	Grona filiformis	M	Shrubs <1m	0.01
	Indigofera linifolia	M	Shrubs <1m	0.02
	Indigofera trita	M	Shrubs <1m	0.02
	Aristida latifolia	G	Grasses	0.03
	Eragrostis tenellula	G	Grasses	0.01
	Eriachne obtusa	G	Grasses	0.5
	Poaceae sp. 3 (sterile)	G	Grasses	0.02
	Sorghum plumosum	G	Grasses	0.1
	Sporobolus australasicus	G	Grasses	0.01
	Triodia intermedia	G	Grasses	50
	Xerochloa barbata	G	Grasses	0.01
	Fimbristylis schultzii	G	Sedges	0.01
	Cajanus marmoratus	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.1
ELA36	*Acacia synchronicia*	M	Shrubs 1-2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	0.4
	**Vachellia farnesiana*	M	Shrubs <1m	0.05
	Atalaya hemiglauca	M	Shrubs <1m	0.02
	Chamaecrista symonii	M	Shrubs <1m	0.02
	Cullen badocanum	M	Shrubs <1m	0.05
	Gossypium australe	M	Shrubs <1m	0.05
	Indigofera linifolia	M	Shrubs <1m	0.01
	Dactyloctenium radulans	G	Grasses	0.01
	Eriachne glauca	G	Grasses	0.05
	Sehima nervosum	G	Grasses	0.05
	Sporobolus australasicus	G	Grasses	0.5
	Triodia intermedia	G	Grasses	50
	Xerochloa barbata	G	Grasses	0.1
	Fimbristylis schultzii	G	Sedges	0.01
	Arivela viscosa	G	Herbs	0.01
	Blumea integrifolia	G	Herbs	0.01
	Blumea tenella	G	Herbs	0.02
	Buchnera asperata	G	Herbs	0.02
	Buchnera ramosissima	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.05
	Crotalaria montana var. *angustifolia*	G	Herbs	0.02
	Euphorbia schultzii var. *comans*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.1

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Ipomoea coptica	G	Herbs	0.02
	Stemodia lathraia	G	Herbs	0.01
	Trianthema oxycalyptrum var. *oxycalyptrum*	G	Herbs	0.01
ELA37	*Atalaya hemiglauca*	U	Trees <10m	2.5
	Acacia synchronicia	M	Shrubs >2m	3
	Abutilon otocarpum	M	Shrubs 1-2m	0.04
	Carissa lanceolata	M	Shrubs 1-2m	3.5
	Dichrostachys spicata	M	Shrubs 1-2m	0.5
	Gossypium australe	M	Shrubs 1-2m	0.04
	Chamaecrista symonii	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.01
	Cullen badocanum	M	Shrubs <1m	0.02
	Indigofera colutea	M	Shrubs <1m	0.02
	Indigofera linifolia	M	Shrubs <1m	0.01
	Indigofera linnaei	M	Shrubs <1m	0.01
	Aristida latifolia	G	Grasses	0.04
	Cynodon convergens	G	Grasses	0.02
	Dactyloctenium radulans	G	Grasses	0.05
	Enneapogon pallidus	G	Grasses	0.5
	Eragrostis cumingii	G	Grasses	0.5
	Eragrostis tenellula	G	Grasses	0.1
	Eriachne obtusa	G	Grasses	1
	Panicum decompositum	G	Grasses	0.02
	Sehima nervosum	G	Grasses	5
	Sporobolus australasicus	G	Grasses	2
	Triodia wiseana	G	Grasses	25
	Xerochloa barbata	G	Grasses	0.05
	Afrohybanthus enneaspermus	G	Herbs	0.01
	Arivela viscosa	G	Herbs	0.01
	Blumea tenella	G	Herbs	0.02
	Evolvulus alsinoides	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
ELA38	*Bauhinia cunninghamii*	U	Trees <10m	0.03
	Hakea macrocarpa	U	Trees <10m	0.05
	Acacia synchronicia	M	Shrubs 1-2m	0.05
	Carissa lanceolata	M	Shrubs 1-2m	0.1
	Dichrostachys spicata	M	Shrubs 1-2m	0.06
	Corchorus fascicularis	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.01
	Gossypium australe	M	Shrubs <1m	0.03
	Grevillea pyramidalis	M	Shrubs <1m	0.05

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Indigofera colutea	M	Shrubs <1m	0.01
	Indigofera linifolia	M	Shrubs <1m	0.01
	Solanum quadriloculatum	M	Shrubs <1m	0.01
	Aristida hygrometrica	G	Grasses	20
	Dactyloctenium radulans	G	Grasses	0.01
	Eragrostis eriopoda	G	Grasses	5
	Perotis rara	G	Grasses	0.01
	Sehima nervosum	G	Grasses	0.02
	Sorghum plumosum	G	Grasses	20
	Sporobolus australasicus	G	Grasses	0.01
	Triodia intermedia	G	Grasses	30
	Cyperus sp.	G	Sedges	0.01
	Boerhavia coccinea	G	Herbs	0.01
	Cajanus marmoratus	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.04
	Crotalaria brevis	G	Herbs	0.01
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.02
	Cucumis melo	G	Herbs	0.01
	Euphorbia trigonosperma	G	Herbs	0.03
	Gomphrena canescens	G	Herbs	0.02
	Gomphrena occulta	G	Herbs	0.02
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.03
	Murdannia graminea	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.03
	Polycarpaea longiflora	G	Herbs	0.01
	Polygala tepperi	G	Herbs	0.03
	Polymeria ambigua	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.06
ELA39	*Adansonia gregorii*	U	Trees 10-20m	1
	Hakea chordophylla	U	Trees <10m	0.1
	Hakea macrocarpa	U	Trees <10m	0.1
	Acacia inaequilatera	M	Shrubs 1-2m	1
	Dolichandrone occidentalis	M	Shrubs 1-2m	0.5
	Abutilon lepidum	M	Shrubs <1m	0.02
	Corchorus fascicularis	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.05
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.5
	Gossypium australe	M	Shrubs <1m	0.1
	Grevillea pyramidalis	M	Shrubs <1m	0.5
	Indigofera colutea	M	Shrubs <1m	0.5

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Indigofera linifolia	M	Shrubs <1m	0.5
	Indigofera linnaei	M	Shrubs <1m	4
	Senna notabilis	M	Shrubs <1m	0.1
	**Cenchrus setiger*	G	Grasses	2
	Aristida holathera	G	Grasses	0.02
	Aristida hygrometrica	G	Grasses	0.5
	Cynodon convergens	G	Grasses	0.05
	Eragrostis eriopoda	G	Grasses	0.2
	Panicum decompositum	G	Grasses	0.1
	Sorghum plumosum	G	Grasses	0.5
	Sporobolus australasicus	G	Grasses	0.1
	Triodia intermedia	G	Grasses	15
	Fimbristylis schultzii	G	Sedges	0.01
	Afrohybanthus aurantiacus	G	Herbs	0.05
	Arivela tetrandra	G	Herbs	0.01
	Arivela viscosa	G	Herbs	0.1
	Boerhavia coccinea	G	Herbs	0.01
	Bonamia pannosa	G	Herbs	0.1
	Buchnera ramosissima	G	Herbs	0.1
	Cajanus marmoratus	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.01
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.5
	Euphorbia psilosperma	G	Herbs	0.5
	Evolvulus alsinoides	G	Herbs	0.2
	Gomphrena canescens	G	Herbs	0.01
	Goodenia sepalosa var. sepalosa	G	Herbs	0.01
	Heliotropium foliatum	G	Herbs	0.05
	Josephinia papillosa	G	Herbs	0.01
	Phyllanthus maderaspatensis	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.2
	Polycarpaea corymbosa	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.1
	Portulaca digyna	G	Herbs	0.01
	Pterocaulon intermedium	G	Herbs	0.05
	Ptilotus corymbosus	G	Herbs	0.05
	Ptilotus fusiformis	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.05
	Striga curviflora	G	Herbs	0.2
	Tephrosia rosea	G	Herbs	0.01
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01
	Trigastrotheca molluginea	G	Herbs	0.1

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Adansonia gregorii	U	Trees 10-20m	0.5
	Dolichandrone occidentalis	U	Trees <10m	4
	Hakea chordophylla	U	Trees <10m	1.5
	Grevillea pyramidalis	M	Shrubs >2m	0.5
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.2
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.3
	Gossypium australe	M	Shrubs <1m	0.05
	Indigofera colutea	M	Shrubs <1m	1.5
	Indigofera linifolia	M	Shrubs <1m	0.5
	Senna notabilis	M	Shrubs <1m	0.05
	Aristida holathera	G	Grasses	0.2
	Aristida hygrometrica	G	Grasses	0.4
	Cenchrus setiger	G	Grasses	0.2
	Cynodon convergens	G	Grasses	0.5
	Eragrostis eriopoda	G	Grasses	0.2
	Sorghum plumosum	G	Grasses	15
	Sporobolus australasicus	G	Grasses	0.05
	Triodia intermedia	G	Grasses	10
	Fimbristylis schultzii	G	Sedges	0.2
	Afrohybanthus aurantiacus	G	Herbs	0.1
ELA40	*Arivela tetrandra*	G	Herbs	0.3
	Boerhavia coccinea	G	Herbs	0.15
	Bonamia pannosa	G	Herbs	0.2
	Buchnera ramosissima	G	Herbs	0.1
	Cajanus marmoratus	G	Herbs	0.1
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.5
	Euphorbia psilosperma	G	Herbs	0.3
	Evolvulus alsinoides	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.5
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.05
	Heliotropium foliatum	G	Herbs	0.1
	Phyllanthus maderaspatensis	G	Herbs	0.05
	Pluchea tetranthera	G	Herbs	0.1
	Polycarpaea corymbosa	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.1
	Portulaca digyna	G	Herbs	0.1
	Pterocaulon intermedium	G	Herbs	0.2
	Ptilotus fusiformis	G	Herbs	0.05
	Rhynchosia minima	G	Herbs	0.2
	Tephrosia rosea	G	Herbs	0.05
	Trichodesma zeylanicum var. *zeylanicum*	G	Herbs	0.01

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	Trigastrotheca molluginea	G	Herbs	0.1
ELA41	*Adansonia gregorii*	U	Trees <10m	2
	Atalaya hemiglauca	U	Trees <10m	4.5
	Dolichandrone occidentalis	U	Trees <10m	0.5
	Hakea macrocarpa	U	Trees <10m	0.5
	Terminalia canescens	U	Trees <10m	2
	Acacia colei	M	Shrubs >2m	5
	Melaleuca alsophila	M	Shrubs >2m	6
	**Vachellia farnesiana*	M	Shrubs 1-2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	2
	Flueggea virosa subsp. *melanthesoides*	M	Shrubs 1-2m	1.5
	Grevillea pyramidalis	M	Shrubs 1-2m	0.5
	Corchorus fascicularis	M	Shrubs <1m	0.2
	Gossypium australe	M	Shrubs <1m	0.1
	Hibiscus austrinus	M	Shrubs <1m	0.02
	Indigofera colutea	M	Shrubs <1m	1.5
	Senna artemisioides subsp. *Oligophylla*	M	Shrubs <1m	0.2
	Chrysopogon fallax	G	Grasses	0.5
	Cynodon convergens	G	Grasses	0.1
	Dactyloctenium radulans	G	Grasses	0.05
	Eragrostis eriopoda	G	Grasses	0.2
	Panicum decompositum	G	Grasses	0.05
	Sorghum plumosum	G	Grasses	2
	Sporobolus australasicus	G	Grasses	0.5
	Triodia bitextura	G	Grasses	30
	Triodia intermedia	G	Grasses	5
	Fimbristylis schultzii	G	Sedges	0.01
	**Portulaca oleracea*	G	Herbs	0.01
	Afrohybanthus enneaspermus	G	Herbs	0.01
	Bergia henshallii	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.1
	Cajanus marmoratus	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.1
	Crotalaria brevis	G	Herbs	0.01
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.1
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.1
	Neptunia gracilis forma. *gracilis*	G	Herbs	0.2
	Phyllanthus maderaspatensis	G	Herbs	0.03
	Pluchea tetranthera	G	Herbs	0.1

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Polymeria ambigua	G	Herbs	0.2
	Rhynchosia minima	G	Herbs	0.2
	Tephrosia leptoclada	G	Herbs	0.01
ELA42	*Adansonia gregorii*	U	Trees <10m	2
	Atalaya hemiglauca	U	Trees <10m	0.5
	Bauhinia cunninghamii	U	Trees <10m	1.5
	Corymbia greeniana	U	Trees <10m	1
	Hakea arborescens	U	Trees <10m	0.05
	Hakea macrocarpa	U	Trees <10m	1.8
	Terminalia canescens	U	Trees <10m	1
	Melaleuca alsophila	M	Shrubs >2m	0.5
	Acacia colei	M	Shrubs 1-2m	0.4
	Carissa lanceolata	M	Shrubs 1-2m	1
	Flueggea virosa subsp. *melanthesoides*	M	Shrubs 1-2m	0.15
	Grevillea pyramidalis	M	Shrubs 1-2m	0.05
	**Stylosanthes hamata*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.02
	Corchorus fascicularis	M	Shrubs <1m	0.02
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.02
	Indigofera colutea	M	Shrubs <1m	0.01
	Cynodon convergens	G	Grasses	0.01
	Eriachne obtusa	G	Grasses	5
	Sorghum plumosum	G	Grasses	20
	Sporobolus australasicus	G	Grasses	0.01
	Triodia bitextura	G	Grasses	40
	**Portulaca oleracea*	G	Herbs	0.01
	**Portulaca pilosa*	G	Herbs	0.01
	Afrohybanthus enneaspermus	G	Herbs	0.02
	Cajanus marmoratus	G	Herbs	0.01
	Capparis lasiantha	G	Herbs	0.02
	Cassytha filiformis	G	Herbs	1.5
	Euphorbia psilosperma	G	Herbs	0.02
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.05
	Phyllanthus maderaspatensis	G	Herbs	0.02
	Pluchea tetranthera	G	Herbs	1
	Polymeria ambigua	G	Herbs	0.01
ELA43	*Atalaya hemiglauca*	U	Trees <10m	0.5
	Bauhinia cunninghamii	U	Trees <10m	10
	Corymbia zygophylla	U	Trees <10m	4
	Ehretia saligna	U	Trees <10m	2

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Gyrocarpus americanus	U	Trees <10m	3
	Acacia platycarpa	M	Shrubs >2m	3
	Carissa lanceolata	M	Shrubs 1-2m	0.5
	Senna costata	M	Shrubs 1-2m	0.2
	Abutilon lepidum	M	Shrubs <1m	0.1
	Abutilon otocarpum	M	Shrubs <1m	0.2
	Corchorus fascicularis	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.2
	Indigofera colutea	M	Shrubs <1m	0.1
	Senna notabilis	M	Shrubs <1m	0.1
	Aristida hygrometrica	G	Grasses	25
	Aristida latifolia	G	Grasses	0.05
	Perotis rara	G	Grasses	0.1
	**Portulaca pilosa*	G	Herbs	0.01
	Amaranthus undulatus	G	Herbs	0.02
	Arivela viscosa	G	Herbs	0.1
	Boerhavia coccinea	G	Herbs	0.2
	Bonamia linearis	G	Herbs	0.5
	Calandrinia strophiolata	G	Herbs	0.01
	Crotalaria brevis	G	Herbs	0.5
	Crotalaria cunninghamii	G	Herbs	0.8
	Euphorbia psilosperma	G	Herbs	0.05
	Euphorbia schultzii var. *comans*	G	Herbs	0.2
	Glycine tomentella	G	Herbs	0.5
	Melhania oblongifolia	G	Herbs	0.1
	Polymeria ambigua	G	Herbs	0.1
	Portulaca oleracea	G	Herbs	0.01
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.05
	Tinospora smilacina	G	Herbs	0.1
	Trianthema pilosum	G	Herbs	0.2
ELA44	*Adansonia gregorii*	U	Trees 10-20m	1
	Corymbia greeniana	U	Trees <10m	6
	Dolichandrone occidentalis	U	Trees <10m	0.5
	Hakea macrocarpa	U	Trees <10m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	2
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	0.5
	Aristida hygrometrica	G	Grasses	0.6
	Eriachne obtusa	G	Grasses	0.1
	Panicum effusum	G	Grasses	0.1
	Perotis rara	G	Grasses	0.01

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Sorghum plumosum	G	Grasses	30
	Fimbristylis ferruginea	G	Sedges	0.5
	**Portulaca pilosa*	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.2
	Cajanus marmoratus	G	Herbs	0.05
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.1
	Drosera derbyensis	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.2
	Gomphrena canescens	G	Herbs	0.1
ELA45	*Atalaya hemiglauca*	U	Trees <10m	1.5
	Bauhinia cunninghamii	U	Trees <10m	4
	Dolichandrone occidentalis	U	Trees <10m	2
	Ehretia saligna	U	Trees <10m	0.5
	Gyrocarpus americanus	U	Trees <10m	1
	Acacia platycarpa	M	Shrubs >2m	3
	Carissa lanceolata	M	Shrubs 1-2m	0.2
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.2
	Gossypium australe	M	Shrubs <1m	0.2
	Indigofera colutea	M	Shrubs <1m	0.1
	**Cenchrus setiger*	G	Grasses	0.05
	Aristida hygrometrica	G	Grasses	45
	Eriachne obtusa	G	Grasses	0.1
	Perotis rara	G	Grasses	0.01
	**Portulaca pilosa*	G	Herbs	0.05
	Alysicarpus muelleri	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.1
	Bonamia pannosa	G	Herbs	0.05
	Cajanus marmoratus	G	Herbs	0.01
	Crotalaria brevis	G	Herbs	0.1
	Euphorbia psilosperma	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Polygala tepperi	G	Herbs	0.01
	Trianthema pilosum	G	Herbs	0.5
ELA46	*Adansonia gregorii*	U	Trees <10m	0.5
	Corymbia greeniana	U	Trees <10m	5
	Hakea chordophylla	U	Trees <10m	1
	Hakea macrocarpa	U	Trees <10m	0.2
	Dolichandrone occidentalis	M	Shrubs 1-2m	0.1
	Grevillea pyramidalis	M	Shrubs 1-2m	0.2
	Psydrax sp.	M	Shrubs 1-2m	0.1
	Grona filiformis	M	Shrubs <1m	0.01

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	Aristida hygrometrica	G	Grasses	1
	Eriachne obtusa	G	Grasses	0.1
	Sorghum plumosum	G	Grasses	30
	Sporobolus australasicus	G	Grasses	0.05
	Triodia bitextura	G	Grasses	0.5
	Fimbristylis ferruginea	G	Sedges	2
	Boerhavia coccinea	G	Herbs	0.05
	Euphorbia psilosperma	G	Herbs	0.05
	Gomphrena canescens	G	Herbs	0.1
	Pluchea tetranthera	G	Herbs	0.1
ELA47	*Eucalyptus coolabah*	U	Trees 10-20m	40
	Atalaya hemiglauca	M	Shrubs 1-2m	0.02
	Abutilon otocarpum	M	Shrubs <1m	0.01
	Acacia colei	M	Shrubs <1m	0.01
	Corchorus fascicularis	M	Shrubs <1m	0.02
	Dolichandrone occidentalis	M	Shrubs <1m	0.01
	Gossypium australe	M	Shrubs <1m	0.02
	Indigofera colutea	M	Shrubs <1m	0.01
	Indigofera linifolia	M	Shrubs <1m	0.05
	Aristida hygrometrica	G	Grasses	40
	Aristida latifolia	G	Grasses	0.01
	Eragrostis eriopoda	G	Grasses	0.5
	Panicum effusum	G	Grasses	0.01
	Perotis rara	G	Grasses	0.01
	Sporobolus australasicus	G	Grasses	0.01
	Triodia bitextura	G	Grasses	20
	Cyperus blakeanus	G	Sedges	0.5
	**Portulaca pilosa*	G	Herbs	0.01
	Bergia henshallii	G	Herbs	0.02
	Calandrinia strophiolata	G	Herbs	0.02
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.01
	Evolvulus alsinoides var. *villosicalyx*	G	Herbs	0.01
	Goodenia lamprosperma	G	Herbs	0.2
	Marsilea hirsuta	G	Herbs	0.01
	Peplidium muelleri	G	Herbs	0.05
	Pluchea tetranthera	G	Herbs	0.01
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.01
	Rhynchosia minima	G	Herbs	0.02
ELA48	*Corymbia greeniana*	U	Trees <10m	6
	Erythrophleum chlorostachys	U	Trees <10m	1.5
	Atalaya hemiglauca	M	Shrubs 1-2m	0.05

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Carissa lanceolata	M	Shrubs 1-2m	0.1
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.08
	Gossypium australe	M	Shrubs <1m	0.04
	**Cenchrus setiger*	G	Grasses	0.01
	Aristida hygrometrica	G	Grasses	80
	Aristida latifolia	G	Grasses	0.1
	Cynodon convergens	G	Grasses	0.01
	Eragrostis eriopoda	G	Grasses	0.5
	Sorghum plumosum	G	Grasses	0.01
	?Operculina sp.	G	Herbs	0.05
	Boerhavia coccinea	G	Herbs	0.1
	Bonamia linearis	G	Herbs	0.05
	Bonamia pannosa	G	Herbs	0.03
	Calandrinia strophiolata	G	Herbs	0.02
	Euphorbia psilosperma	G	Herbs	0.01
	Evolvulus alsinoides var. *villosicalyx*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.04
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
ELA49	*Erythrophleum chlorostachys*	U	Trees <10m	1.5
	Eucalyptus coolabah	U	Trees <10m	5
	Atalaya hemiglauca	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.02
	Melaleuca alsophila	M	Shrubs <1m	0.05
	Aristida hygrometrica	G	Grasses	80
	Cynodon convergens	G	Grasses	0.01
	Eragrostis eriopoda	G	Grasses	0.1
	Cyperus blakeanus	G	Sedges	0.1
	Arivela viscosa	G	Herbs	0.01
	Bergia trimera	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.05
	Bonamia linearis	G	Herbs	0.03
	Bonamia pannosa	G	Herbs	0.05
	Cajanus marmoratus	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.03
	Polygala tepperi	G	Herbs	0.01
	Tinospora smilacina	G	Herbs	0.02
ELA50	*Corymbia zygophylla*	U	Trees <10m	4
	Erythrophleum chlorostachys	U	Trees <10m	5
	Acacia tumida	M	Shrubs >2m	20
	Chamaecrista symonii	M	Shrubs <1m	0.02

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Waltheria indica	M	Shrubs <1m	0.2
	Aristida hygrometrica	G	Grasses	30
	Eriachne obtusa	G	Grasses	1.5
	Setaria surgens	G	Grasses	0.2
	Triodia bitextura	G	Grasses	10
	Boerhavia coccinea	G	Herbs	0.2
	Bonamia linearis	G	Herbs	0.1
	Bonamia pannosa	G	Herbs	0.2
	Calandrinia strophiolata	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.1
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.01
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.2
	Ptilotus corymbosus	G	Herbs	0.01
	Tinospora smilacina	G	Herbs	0.1
ELA51	*Atalaya hemiglauca*	U	Trees <10m	0.5
	Bauhinia cunninghamii	U	Trees <10m	0.5
	Corymbia greeniana	U	Trees <10m	5
	Corymbia zygophylla	U	Trees <10m	2
	Dolichandrone occidentalis	U	Trees <10m	0.5
	Erythrophleum chlorostachys	U	Trees <10m	8
	Gyrocarpus americanus	U	Trees <10m	0.5
	Acacia platycarpa	M	Shrubs >2m	10
	Acacia tumida	M	Shrubs 1-2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	3
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.2
	Aristida hygrometrica	G	Grasses	12
	Eriachne obtusa	G	Grasses	0.5
	Triodia bitextura	G	Grasses	5
	Arivela tetrandra	G	Herbs	0.01
	Arivela viscosa	G	Herbs	0.1
	Boerhavia coccinea	G	Herbs	0.15
	Bonamia linearis	G	Herbs	0.2
	Bonamia pannosa	G	Herbs	0.05
	Cajanus marmoratus	G	Herbs	0.01
	Calandrinia strophiolata	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.1
	Euphorbia psilosperma	G	Herbs	0.02
	Polymeria ambigua	G	Herbs	0.1
	Portulaca digyna	G	Herbs	0.01

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Portulaca oleracea	G	Herbs	0.01
	Roepera sp.	G	Herbs	0.01
	Tephrosia rosea	G	Herbs	0.05
	Tinospora smilacina	G	Herbs	0.01
	Trianthema pilosum	G	Herbs	0.3
ELA52	*Bauhinia cunninghamii*	U	Trees <10m	0.5
	Corymbia greeniana	U	Trees <10m	0.5
	Corymbia zygophylla	U	Trees <10m	5
	Erythrophleum chlorostachys	U	Trees <10m	5
	Grevillea wickhamii	U	Trees <10m	0.2
	Acacia tumida	M	Shrubs >2m	10
	Chamaecrista symonii	M	Shrubs <1m	0.2
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.2
	Indigofera linifolia	M	Shrubs <1m	0.1
	Waltheria indica	M	Shrubs <1m	0.2
	Aristida hygrometrica	G	Grasses	0.4
	Eragrostis eriopoda	G	Grasses	0.4
	Eriachne obtusa	G	Grasses	0.5
	Sorghum plumosum	G	Grasses	0.2
	Triodia bitextura	G	Grasses	40
	Boerhavia coccinea	G	Herbs	0.05
	Bonamia linearis	G	Herbs	0.2
	Cajanus marmoratus	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.05
	Euphorbia schultzii var. *comans*	G	Herbs	0.1
	Evolvulus alsinoides	G	Herbs	0.01
	Polygala tepperi	G	Herbs	0.02
	Polymeria ambigua	G	Herbs	0.1
	Portulaca digyna	G	Herbs	0.01
	Tephrosia rosea	G	Herbs	0.1
	Tinospora smilacina	G	Herbs	0.1
ELA53	*Bauhinia cunninghamii*	U	Trees <10m	0.3
	Erythrophleum chlorostachys	U	Trees <10m	10
	Acacia tumida	M	Shrubs >2m	0.2
	Carissa lanceolata	M	Shrubs <1m	0.03
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.05
	Dolichandrone occidentalis	M	Shrubs <1m	0.02
	Grona filiformis	M	Shrubs <1m	0.02
	Indigofera linifolia	M	Shrubs <1m	0.04
	Senna notabilis	M	Shrubs <1m	0.01
	Aristida hygrometrica	G	Grasses	65

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Quadrat	Species	Stratum	Lifeform	Cover (%)
	Aristida latifolia	G	Grasses	0.5
	Eragrostis eriopoda	G	Grasses	1
	Arivela tetrandra	G	Herbs	0.01
	Arivela viscosa	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.05
	Bonamia linearis	G	Herbs	0.05
	Bonamia pannosa	G	Herbs	0.1
	Buchnera ramosissima	G	Herbs	0.02
	Cajanus marmoratus	G	Herbs	0.01
	Calandrinia sp.	G	Herbs	0.01
	Euphorbia psilosperma	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.02
	Goodenia sp.	G	Herbs	0.01
	Trianthema pilosum	G	Herbs	0.3
ELA54	*Corymbia greeniana*	U	Trees <10m	4
	Erythrophleum chlorostachys	U	Trees <10m	2
	Hakea macrocarpa	U	Trees <10m	0.2
	Acacia ancistrocarpa	M	Shrubs 1-2m	5
	Carissa lanceolata	M	Shrubs 1-2m	1.5
	Dodonaea hispidula var. *arida*	M	Shrubs 1-2m	3
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.2
	Gossypium australe	M	Shrubs <1m	0.02
	Waltheria indica	M	Shrubs <1m	0.1
	Aristida hygrometrica	G	Grasses	30
	Aristida latifolia	G	Grasses	0.1
	Eriachne obtusa	G	Grasses	2.5
	Triodia bitextura	G	Grasses	0.5
	Bonamia linearis	G	Herbs	0.5
	Bonamia pannosa	G	Herbs	0.1
	Euphorbia psilosperma	G	Herbs	0.1
	Gomphrena canescens	G	Herbs	0.1
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Pluchea tetranthera	G	Herbs	0.05
	Polymeria ambigua	G	Herbs	0.1
	Portulaca digyna	G	Herbs	0.01
	Stackhousia intermedia	G	Herbs	0.01
	Trigastrotheca molluginea	G	Herbs	0.05
ELA55	*Atalaya hemiglauca*	U	Trees <10m	2.5
	Bauhinia cunninghamii	U	Trees <10m	15
	Corymbia greeniana	U	Trees <10m	5
	Flueggea virosa subsp. *melanthesoides*	M	Shrubs >2m	3

Quadrat	Species	Stratum	Lifeform	Cover (%)
	**Vachellia farnesiana*	M	Shrubs 1-2m	0.5
	Acacia colei	M	Shrubs 1-2m	0.5
	Carissa lanceolata	M	Shrubs 1-2m	1
	Abutilon lepidum	M	Shrubs <1m	0.1
	Corchorus fascicularis	M	Shrubs <1m	20
	Corchorus sidoides subsp. *vermicularis*	M	Shrubs <1m	0.2
	Gossypium australe	M	Shrubs <1m	0.2
	Hibiscus austrinus	M	Shrubs <1m	0.1
	Senna notabilis	M	Shrubs <1m	0.1
	Amaranthus mitchellii	G	Herbs	0.1
	Arivela viscosa	G	Herbs	2
	Boerhavia coccinea	G	Herbs	0.5
	Cassytha filiformis	G	Herbs	0.1
	Crotalaria medicaginea var. neglecta	G	Herbs	0.02
	Evolvulus alsinoides	G	Herbs	0.05
	Indigofera hirsuta	G	Herbs	30
	Polymeria ambigua	G	Herbs	0.1
	Portulaca oleracea	G	Herbs	0.1
	Tinospora smilacina	G	Herbs	0.01
ELA56	*Corymbia bella*	U	Trees <10m	8
	Lophostemon grandiflorus subsp. *riparius*	U	Trees <10m	0.5
	Acacia colei	M	Shrubs 1-2m	0.04
	**Vachellia farnesiana*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.02
	Dolichandrone occidentalis	M	Shrubs <1m	0.01
	Grona filiformis	M	Shrubs <1m	0.01
	Indigofera linifolia	M	Shrubs <1m	0.04
	Melaleuca alsophila	M	Shrubs <1m	0.05
	Eragrostis eriopoda	G	Grasses	0.01
	Triodia bitextura	G	Grasses	80
	Triodia wiseana	G	Grasses	2
	Cyperus latzii	G	Sedges	0.04
	Arivela viscosa	G	Herbs	0.05
	Boerhavia coccinea	G	Herbs	0.03
	Euphorbia psilosperma	G	Herbs	0.01
	Evolvulus alsinoides var. *villosicalyx*	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.03
	Indigofera hirsuta	G	Herbs	0.01
	Peplidium muelleri	G	Herbs	0.02
	Pluchea tetranthera	G	Herbs	0.03

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Trianthema pilosum	G	Herbs	0.02
ELA57	*Corymbia bella*	U	Trees <10m	50
	Lophostemon grandiflorus subsp. *riparius*	U	Trees <10m	25
	Sesbania cannabina	M	Shrubs 1-2m	0.5
	Arivela viscosa	G	Herbs	0.2
	Marsilea hirsuta	G	Herbs	0.1
	Nymphoides beaglensis (P3)	G	Herbs	0.5
	Peplidium muelleri	G	Herbs	2
ELA58	*Corymbia bella*	U	Trees <10m	20
	Acacia colei	M	Shrubs 1-2m	0.2
	**Vachellia farnesiana*	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.05
	Indigofera linifolia	M	Shrubs <1m	0.02
	Aristida hygrometrica	G	Grasses	0.2
	Eragrostis eriopoda	G	Grasses	0.01
	Triodia bitextura	G	Grasses	60
	Schoenoplectiella lateriflora var. *lateriflora*	G	Sedges	0.01
	**Portulaca pilosa*	G	Herbs	0.02
	Alternanthera angustifolia	G	Herbs	0.05
	Arivela viscosa	G	Herbs	0.1
	Calandrinia strophiolata	G	Herbs	0.01
	Eriocaulon cinereum	G	Herbs	0.01
	Evolvulus alsinoides var. *villosicalyx*	G	Herbs	0.01
	Nymphoides beaglensis (P3)	G	Herbs	0.01
	Peplidium muelleri	G	Herbs	0.5
ELA59	*Corymbia greeniana*	U	Trees 10-20m	2.5
	Corymbia zygophylla	U	Trees <10m	6
	Erythrophleum chlorostachys	U	Trees <10m	2
	Acacia tumida	M	Shrubs >2m	35
	Grevillea pyramidalis	M	Shrubs 1-2m	0.01
	**Calotropis procera*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.05
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.05
	Dolichandrone occidentalis	M	Shrubs <1m	0.04
	Senna notabilis	M	Shrubs <1m	0.01
	Solanum quadriloculatum	M	Shrubs <1m	0.01
	Aristida hygrometrica	G	Grasses	0.5
	Eriachne melicacea	G	Grasses	0.01
	Eriachne obtusa	G	Grasses	25
	Triodia wiseana	G	Grasses	0.2
	Amaranthus undulatus	G	Herbs	0.02

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Bonamia linearis	G	Herbs	0.2
	Bonamia pannosa	G	Herbs	0.2
	Cajanus marmoratus	G	Herbs	0.02
	Calandrinia strophiolata	G	Herbs	0.01
	Euphorbia cinerea	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.01
	Goodenia armitiana	G	Herbs	0.02
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.01
	Pterocaulon serrulatum var. *velutinum*	G	Herbs	0.01
	Tinospora smilacina	G	Herbs	0.01
ELA60	*Bauhinia cunninghamii*	U	Trees 10-20m	0.05
	Corymbia zygophylla	U	Trees 10-20m	3.5
	Ehretia saligna	U	Trees <10m	0.04
	Gyrocarpus americanus	U	Trees <10m	0.05
	Acacia platycarpa	M	Shrubs >2m	1
	Acacia tumida	M	Shrubs >2m	10
	Senna costata	M	Shrubs 1-2m	0.02
	Waltheria indica	M	Shrubs 1-2m	0.05
	**Calotropis procera*	M	Shrubs <1m	0.01
	Abutilon otocarpum	M	Shrubs <1m	0.03
	Capparis lasiantha	M	Shrubs <1m	0.01
	Chamaecrista symonii	M	Shrubs <1m	8
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.1
	Corynotheca micrantha	M	Shrubs <1m	5
	Gymnanthera oblonga	M	Shrubs <1m	0.01
	Sida aff. fibulifera	M	Shrubs <1m	0.01
	Solanum quadriloculatum	M	Shrubs <1m	0.01
	Aristida latifolia	G	Grasses	30
	Cymbopogon ambiguus	G	Grasses	0.02
	Eriachne obtusa	G	Grasses	25
	Triodia wiseana	G	Grasses	1
	Achyranthes aspera	G	Herbs	0.01
	Bonamia linearis	G	Herbs	0.05
	Bonamia pannosa	G	Herbs	0.01
	Evolvulus alsinoides	G	Herbs	0.01
	Gomphrena canescens	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.05
	Tinospora smilacina	G	Herbs	0.01
	Zornia prostrata var. *prostrata*	G	Herbs	0.01
ELA61	*Hakea macrocarpa*	U	Trees <10m	0.01

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Acacia tumida	M	Shrubs >2m	7
	Waltheria indica	M	Shrubs 1-2m	0.02
	Abutilon otocarpum	M	Shrubs <1m	0.01
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.02
	Gymnanthera oblonga	M	Shrubs <1m	0.02
	Melaleuca alsophila	M	Shrubs <1m	5
	Aristida latifolia	G	Grasses	10
	Eriachne obtusa	G	Grasses	8
	Eriachne pindanica	G	Grasses	0.02
	Triodia bitextura	G	Grasses	35
	Bonamia linearis	G	Herbs	0.01
	Bonamia pannosa	G	Herbs	0.01
	Buchnera asperata	G	Herbs	0.01
	Cassytha filiformis	G	Herbs	0.05
	Goodenia armitiana	G	Herbs	0.01
ELA62	*Atalaya hemiglauca*	U	Trees <10m	2
	Bauhinia cunninghamii	U	Trees <10m	0.5
	Corymbia greeniana	U	Trees <10m	0.5
	Gyrocarpus americanus	U	Trees <10m	1.5
	Acacia platycarpa	M	Shrubs >2m	0.5
	Acacia tumida	M	Shrubs >2m	20
	Carissa lanceolata	M	Shrubs 1-2m	0.5
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.5
	Senna notabilis	M	Shrubs <1m	0.05
	Waltheria indica	M	Shrubs <1m	0.1
	**Cenchrus setiger*	G	Grasses	0.1
	Aristida hygrometrica	G	Grasses	40
	Eriachne obtusa	G	Grasses	0.1
	Perotis rara	G	Grasses	0.02
	Triodia bitextura	G	Grasses	5
	**Trianthema pilosum*	G	Herbs	0.02
	Afrohybanthus aurantiacus	G	Herbs	0.01
	Arivela viscosa	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.2
	Bonamia pannosa	G	Herbs	0.3
	Cajanus marmoratus	G	Herbs	0.01
	Crotalaria cunninghamii	G	Herbs	0.1
	Crotalaria medicaginea var. *neglecta*	G	Herbs	0.2
	Cucumis melo	G	Herbs	0.1
	Euphorbia schultzii var. *comans*	G	Herbs	0.1
	Goodenia sepalosa var. *sepalosa*	G	Herbs	0.01

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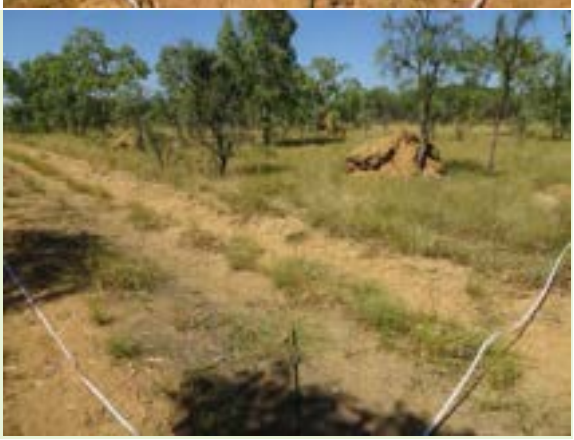
Quadrat	Species	Stratum	Lifeform	Cover (%)
	Heliotropium diversifolium	G	Herbs	0.1
	Ipomoea polymorpha	G	Herbs	0.01
	Polymeria ambigua	G	Herbs	0.05
	Tephrosia rosea	G	Herbs	0.05
	Zornia chaetophora	G	Herbs	0.01
	Zornia prostrata var. *prostrata*	G	Herbs	0.1
ELA63	*Corymbia greeniana*	U	Trees <10m	10
	Gyrocarpus americanus	U	Trees <10m	0.5
	Hakea macrocarpa	U	Trees <10m	0.5
	Acacia tumida	M	Shrubs >2m	0.5
	Acacia ancistrocarpa	M	Shrubs 1-2m	8
	Acacia platycarpa	M	Shrubs 1-2m	0.1
	Carissa lanceolata	M	Shrubs 1-2m	0.5
	Corchorus sidoides subsp. *sidoides*	M	Shrubs <1m	0.1
	Indigofera linifolia	M	Shrubs <1m	0.05
	Indigofera linnaei	M	Shrubs <1m	0.01
	Aristida hygrometrica	G	Grasses	0.5
	Aristida latifolia	G	Grasses	4
	Eragrostis eriopoda	G	Grasses	2
	Setaria surgens	G	Grasses	0.2
	Triodia bitextura	G	Grasses	5
	Triodia intermedia	G	Grasses	6
	Afrohybanthus aurantiacus	G	Herbs	0.01
	Boerhavia coccinea	G	Herbs	0.01
	Bonamia pannosa	G	Herbs	0.1
	Buchnera ramosissima	G	Herbs	0.1
	Cajanus marmoratus	G	Herbs	0.01
	Euphorbia schultzii var. *comans*	G	Herbs	0.2
	Evolvulus alsinoides var. *decumbens*	G	Herbs	0.08
	Pluchea tetranthera	G	Herbs	0.2
	Polymeria ambigua	G	Herbs	0.05
	Spermacoce occidentalis	G	Herbs	0.1
	Tephrosia rosea	G	Herbs	0.01
ELA64	*Eucalyptus coolabah*	U	Trees <10m	4
	Sesbania cannabina	M	Shrubs 1-2m	0.2
	**Stylosanthes hamata*	M	Shrubs <1m	0.5
	Eriachne obtusa	G	Grasses	0.5
	Eulalia aurea	G	Grasses	0.5
	Triodia bitextura	G	Grasses	2
	Triodia epactia	G	Grasses	50
	Cyperus pulchellus	G	Sedges	0.1

Quadrat	Species	Stratum	Lifeform	Cover (%)
	Fimbristylis ferruginea	G	Sedges	0.2
	Fimbristylis schultzii	G	Sedges	0.1
	Bonamia pannosa	G	Herbs	0.05
	Byblis filifolia	G	Herbs	0.01
	Calandrinia tepperiana	G	Herbs	0.01
	Lindernia chrysoplectra	G	Herbs	0.01
	Marsilea hirsuta	G	Herbs	0.01
	Mitrasacme lutea	G	Herbs	0.01
	Murdannia graminea	G	Herbs	0.01
	Nymphoides beaglensis (P3)	G	Herbs	0.01
	Scleromitrion scleranthoides	G	Herbs	0.1
	Uvedalia linearis var. *linearis*	G	Herbs	0.01

Appendix H Site photos

Quadrat number	Photo	Quadrat number	Photo
ELA01		ELA02	
ELA03		ELA04	
ELA05		ELA06	
ELA07		ELA08	

Quadrat number	Photo	Quadrat number	Photo
ELA09		ELA10	
ELA11	N/A	ELA12	N/A
ELA13	N/A	ELA14	
ELA15		ELA16	
ELA17		ELA18	

Quadrat number	Photo	Quadrat number	Photo
ELA19		ELA20	
ELA21		ELA22	
ELA23		ELA24	
ELA25		ELA26	

Quadrat number	Photo	Quadrat number	Photo
ELA27		ELA28	
ELA29		ELA30	
ELA31		ELA32	
ELA33		ELA34	

Quadrat number	Photo	Quadrat number	Photo
ELA35		ELA36	
ELA37		ELA38	
ELA39		ELA40	
ELA41		ELA42	

Quadrat number	Photo	Quadrat number	Photo
ELA43		ELA44	N/A
ELA45		ELA46	
ELA47		ELA48	
ELA49		ELA50	

Quadrat number	Photo	Quadrat number	Photo
ELA51		ELA52	
ELA53		ELA54	
ELA55		ELA56	
ELA57		ELA58	

Quadrat number	Photo	Quadrat number	Photo
ELA59		ELA60	
ELA61		ELA62	
ELA63		ELA64	

Appendix I Location of introduced (weed) species within the Project Area

Species	Ranking	Quadrat number	Easting	Northing
**Calotropis procera* (Calotrope)	Declared Pest – s22(2)	ELA20	687949	7993198
**Calotropis procera* (Calotrope)	Declared Pest – s22(2)	ELA33	699041	7985804
**Calotropis procera* (Calotrope)	Declared Pest – s22(2)	ELA35	690150	7979852
**Calotropis procera* (Calotrope)	Declared Pest – s22(2)	ELA59	711942	7976870
**Calotropis procera* (Calotrope)	Declared Pest – s22(2)	ELA60	713616	7976552
**Cenchrus setiger* (Birdwood Grass)	Permitted – s11	ELA27	690616	7985383
**Cenchrus setiger* (Birdwood Grass)	Permitted – s11	ELA28	691284	7985129
**Cenchrus setiger* (Birdwood Grass)	Permitted – s11	ELA39	696593	7980098
**Cenchrus setiger* (Birdwood Grass)	Permitted – s11	ELA45	704492	7980578
**Cenchrus setiger* (Birdwood Grass)	Permitted – s11	ELA48	707228	7981171
**Cenchrus setiger* (Birdwood Grass)	Permitted – s11	ELA62	716840	7976435
**Malvastrum americanum* (Spiked Malvastrum)	Permitted – s11	ELA10	692546	7997874
**Melochia pyramidata* (Pyramid Flower)	Permitted – s11	ELA07	688535	7998364
**Portulaca oleracea* (Common Purslane)	Permitted – s11	ELA41	701517	7980279
**Portulaca oleracea*	Permitted – s11	ELA42	702048	7980340
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA24	685634	7991962
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA25	685626	7991575
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA27	690616	7985383
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA28	691284	7985129
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA29	692961	7985886
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA31	696524	7985668
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA34	688934	7980819
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA42	702048	7980340
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA43	704590	7982476
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA44	704483	7981302
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA45	704492	7980578
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA47	706410	7981270
**Portulaca pilosa* (Pink Purslane)	Permitted – s11	ELA58	713620	7978355
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA04	686963	8001840
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA05	686873	7998414
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA06	688074	7998385
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA07	688535	7998364

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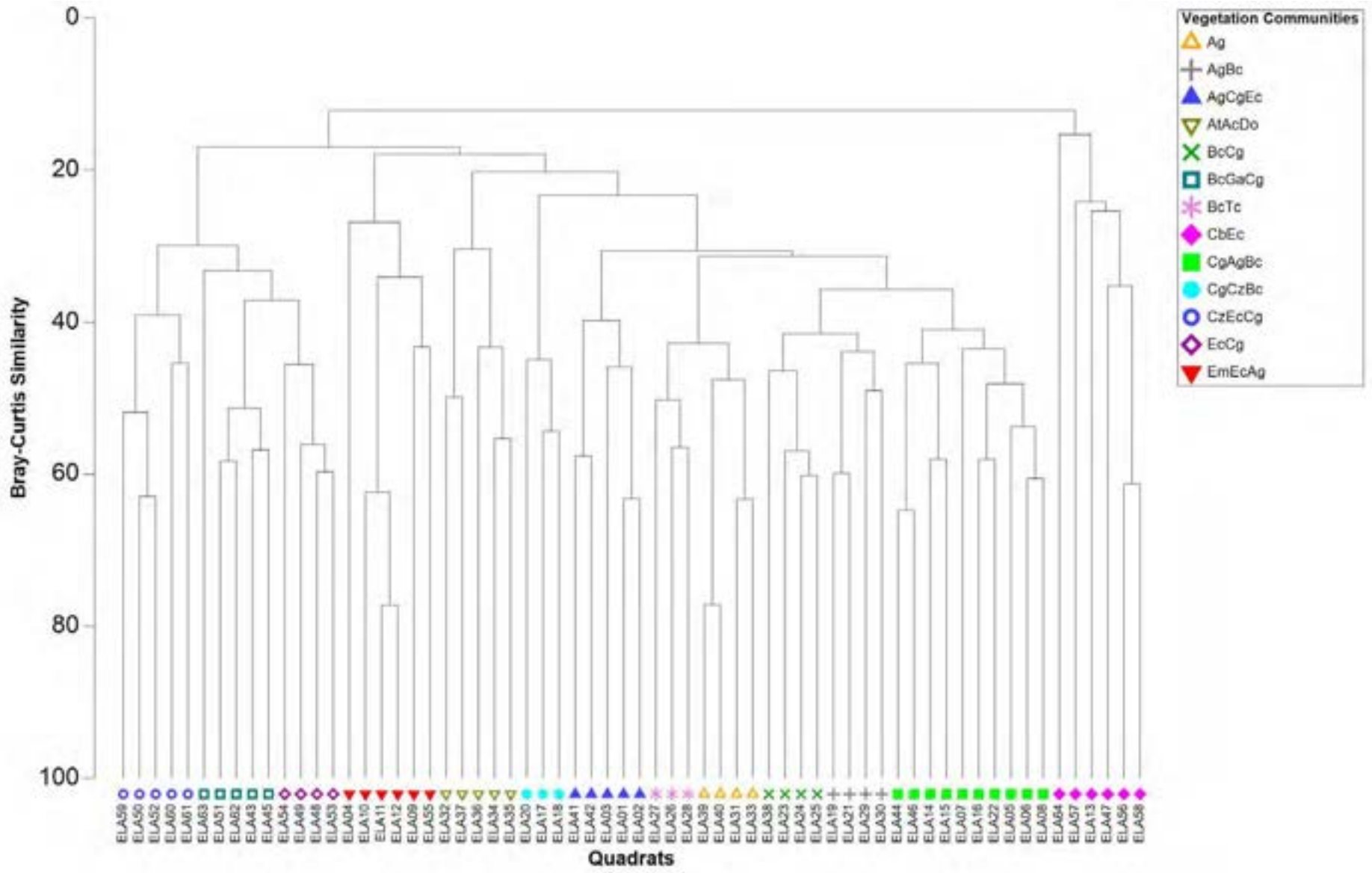
Species	Ranking	Quadrat number	Easting	Northing
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA08	689942	7998198
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA12	692853	7997861
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA13	693108	7997839
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA14	693720	7997803
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA19	690482	7993326
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA21	687755	7992990
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA26	689918	7985266
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA27	690616	7985383
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA28	691284	7985129
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA29	692961	7985886
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA31	696524	7985668
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA34	688934	7980819
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA42	702048	7980340
**Stylosanthes hamata* (Verano Stylo)	Permitted – s11	ELA64	716838	7977401
**Trianthema pilosum*	Permitted – s11	ELA62	716840	7976435
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA10	692546	7997874
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA11	692598	7997881
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA12	692853	7997861
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA36	692240	7980547
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA41	701517	7980279
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA55	712051	7978400
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA56	713211	7978357
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	ELA58	713620	7978355

Appendix J Hierarchical clustering dendrogram



Appendix K Fauna species list

Species	Common name	Sign
Birds		
Accipiter fasciatus	Brown Goshawk	Directly observed
Aprosmictus erythropterus	Red-winged Parrot	Directly observed
Aquila audax	Wedge-tailed Eagle	Directly observed
Ardea pacifica	White-necked Heron	Directly observed
Ardeotis australis	Australian Bustard	Directly observed
Artamus cinereus	Black-faced Woodswallow	Directly observed
Artamus personatus	Masked Woodswallow	Directly observed
Cacatua sanguinea	Little Corella	Directly observed
Calyptorhynchus banksii	Red-tailed Black Cockatoo	Heard
Chrysococcyx basalis	Horsfield's Bronze Cuckoo	Heard
Cincloramphus mathewsi	Rufous Songlark	Directly observed
Conopophila rufogularis	Rufous-throated Honeyeater	Directly observed
Coracina novaehollandiae	Black-faced Cuckooshrike	Directly observed
Corvus bennetti	Little Crow	Directly observed
Corvus orru	Torresian Crow	Directly observed
Cracticus nigrogularis	Pied Butcherbird	Directly observed
Dendrocygna eytoni	Plumed Whistling Duck	Directly observed
Egretta novaehollandiae	White-faced Heron	Directly observed
Elseyornis melanops	Black-fronted Dotteral	Directly observed
Eolophus roseicapilla	Galah	Directly observed
Falco berigora	Brown Falcon	Directly observed
Falco subniger	Black Falcon	Directly observed
Geopelia cuneata	Diamond Dove	Directly observed
Geopelia placida	Peaceful Dove	Heard
Grallina cyanoleuca	Magpie-lark	Directly observed
Grus rubicunda	Brolga	Directly observed
Haliastur sphenurus	Whistling Kite	Heard
Lichenostomus penicillatus	White-plumed Honeyeater	Directly observed
Lichenostomus virescens	Singing Honeyeater	Heard
Lichmera indistincta	Brown Honeyeater	Heard
Malurus coronatus	Purple-crowned Fairywren	Directly observed
Malurus lamberti	Variegated Fairywren	Directly observed
Malurus melanocephalus	Red-backed Fairywren	Directly observed
Manorina flavigula	Yellow-throated Miner	Directly observed

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Species	Common name	Sign
Merops ornatus	Rainbow Bee-eater	Heard
Milvus migrans	Black Kite	Directly observed
Nymphicus hollandicus	Cockatiel	Heard
Ocyphaps lophotes	Crested Pigeon	Directly observed
Pachycephala rufiventris	Rufous Whistler	Heard
Phaps chalcoptera	Common Bronzewing	Directly observed
Philemon citreogularis	Little Friarbird	Directly observed
Pomatostomus temporalis	Grey-crowned Babbler	Heard
Poodytes carteri	Spinifexbird	Heard
Ptilotula flavescens	Yellow-tinted Honeyeater	Directly observed
Rhipidura leucophrys	Willie Wagtail	Directly observed
Smicrornis brevirostris	Weebill	Heard
Spilopelia senegalensis	Laughing Turtle Dove	Directly observed
Taeniopygia guttata	Zebra Finch	Directly observed
Threskiornis spinicollis	Straw-necked Ibis	Directly observed
Todiramphus sanctus	Sacred Kingfisher	Directly observed
Turnix velox	Little Buttonquail	Directly observed
Vanellus miles	Masked Lapwing	Directly observed
Mammals		
**Bos indicus*	Cattle	Directly observed, scats and tracks
**Canis familiaris dingo*	Dingo	Directly observed
Macropus agilis	Agile Wallaby	Directly observed
Macrotis lagotis	Greater Bilby	Diggings
Osphranter rufus	Red Kangaroo	Scats and tracks
Reptiles		
Ctenophorus isolepis	Central Military Dragon	Directly observed
Ctenophorus nuchalis	Central Netted Dragon	Directly observed
Menetia greyii	Common Dwarf Skink	Directly observed
Pogona minor mitchelli	Bearded Dragon	Directly observed
Pseudonaja mengdeni	Western Brown Snake	Directly observed
Tiliqua multifasciata	Central Bluetongue	Directly observed
Varanus gouldii	Sand Goanna	Directly observed
Varanus panoptes	Yellow-spotted Monitor	Directly observed
Invertebrates		
Araneidae sp.	Orb-weaver Spider	Directly Observed
Austracantha minax	Jewel Spider/Christmas Spider	Directly Observed
Diptera sp.	True Flies	Directly Observed

Species	Common name	Sign
Grylloidea sp.	Cricket	Directly Observed
Halyomorpha halys	Stink Bug	Directly Observed
Isoptera sp.	Termites	Directly Observed
Phasmatodea sp.	Stick Insect	Directly Observed
Synemon sp.	Sun Moth	Directly Observed
Tetragonula sp.	Stingless Bee	Directly Observed
Vespula sp.	Wasp	Directly Observed

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EPBC Act	BC Act/ DBCA	Species Name	Date	Quadrat	Easting	Northing	# plants	Pop area (m)
-	P3	*Nymphoides beaglensis*	07/3/2021	ELA57	713276	7978347	50	2500
-	P3	*Nymphoides beaglensis*	07/3/2021	ELA58	713620	7978355	1	2500
-	P3	*Nymphoides beaglensis*	04/3/2021	ELA64	716838	7977401	20	2500
-	P3	*Nymphoides beaglensis*	-	Oppo	716841	7977397	5	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716855	7977389	10	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716869	7977387	14	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716855	7977367	11	-
-	P3	*Nymphoides beaglensis*	-	Oppo	716872	7977362	1	-

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Nymphoides beaglensis **TPFL Pop. No:**

OBSERVATION DATE: 03/04/2021 **CONSERVATION STATUS:** P3 **New population** ☐

OBSERVER/S: E. Chetwin, J. Cargill **PHONE** (08) 6218 2096

ROLE: Botanist **ORGANISATION:** Eco Logical Australia

EMAIL: EmilyC@ecoaus.com.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

ca. 55km west-southwest of Fitzroy Crossing

Reserve No:

DBCA DISTRICT: West Kimberley **LGA:** Shire of Derby/West Kimberley Land manager present: ☐

DATUM:
GDA94 / MGA94 x
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs x
Lat / Northing: 7977409
Long / Easting: 716841
ZONE: 51

METHOD USED:
GPS x Differential GPS ☐ Map ☐
No. satellites: Map used:
Boundary polygon captured: ☐ Map scale:

LAND TENURE:
Nature reserve ☐ Timber reserve ☐ Private property ☐ Rail reserve ☐ Shire road reserve ☐
National park ☐ State forest ☐ Pastoral lease ☐ MRWA road reserve ☐ Other Crown reserve ☐
Conservation park ☐ Water reserve ☐ UCL ☐ SLK/Pole _____ to _____ Specify other:

AREA ASSESSMENT: Edge survey ☐ Partial survey x Full survey ☐ Area observed (m²): 900

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m²:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate x Count method: (Refer to field manual for list)

WHAT COUNTED: Plants x Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:	**Mature:**	**Juveniles:**	**Seedlings:**	**Totals:**
Alive	50			50
Dead				

Area of pop (m²):
Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower x
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: %

CONDITION OF PLANTS: Healthy x Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by: **Sheet No.:** **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression x
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☐
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated x
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated x

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (M.tetragona)

1. Corymbia bella, Eucalyptus coolabah mid open woodland
2. Acacia colei, Lophostemon grandiflorus subsp. riparius, Sesbania cannabina tall sparse shrubland
3. Triodia bitextura low open hummock grassland
4. Aristida hygrometrica, Eriachne obtusa low sparse grassland.

ASSOCIATED SPECIES:
Other (non-dominant) spp

Arivela viscosa, Corchorus sidoides subsp. sidoides, Dolichandrone occidentalis, Eragrostis eriopoda, Evolvulus alsinoides var. villosicalyx, Fimbristylis ferruginea, Indigofera linifolia, Marsilea hirsuta, Nymphoides beaglensis (P3), Peplidium muelleri, *Stylosanthes hamata.

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent x Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

FLORA AUTHORISATION / LICENCE No: FB62000026-3 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no authorisation/licence is required. For further information on authorisation and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: EC975 WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

LODGEMENT: WA Herb Lodgement No: _____

ATTACHED: Map ☐ Mudmap ☐ Photo x3 GIS data ☐ Field notes ☐ Other: Additional locations

COPY SENT TO: Regional Office ☐ District Office ☐ Other: _____

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

Submitter of Record: E. Chetwin Role: Botanist Signed: _____ Date: 14/02/2021

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Appendix D. Desktop Vegetation Assessment

Company	Publish Date	Date	Easting / Long	Northing / Lat	Survey Type	Priority Flora	Weeds / Introduced Flora	Total Area Surveyed (ha)	Number of Veg Communities	Veg Community Name	Veg Community Description	Veg Reference	Priority Fauna	TECs Present
EcoLogical		2021 6/03/2021	687296	8006395	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgCgEc	*Adansonia gregorii* mid isolated trees and *Corymbia greeniana, Erythrophleum chlorostachys, Bauhinia cunninghamii* low open woodland over *Acacia colei, Grevillea pyramidalis, Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low open hummock grassland and *Sorghum plumosum, Chrysopogon fallax* tall open tussock grassland.			0
EcoLogical		2021 6/03/2021	687746	8006336	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgCgEc	*Adansonia gregorii* mid isolated trees and *Corymbia greeniana, Erythrophleum chlorostachys, Bauhinia cunninghamii* low open woodland over *Acacia colei, Grevillea pyramidalis, Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low open hummock grassland and *Sorghum plumosum, Chrysopogon fallax* tall open tussock grassland.			0
EcoLogical		2021 6/03/2021	686802	8002232	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgCgEc	*Adansonia gregorii* mid isolated trees and *Corymbia greeniana, Erythrophleum chlorostachys, Bauhinia cunninghamii* low open woodland over *Acacia colei, Grevillea pyramidalis, Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low open hummock grassland and *Sorghum plumosum, Chrysopogon fallax* tall open tussock grassland.			0
EcoLogical		2021 6/03/2021	686963	8001840	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Carcharus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.			0
EcoLogical		2021 25/05/2021	686873	7998414	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland.			0
EcoLogical		2021 25/05/2021	688074	7998385	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland.			0
EcoLogical		2021 25/05/2021	688535	7998364	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland.			0
EcoLogical		2021 25/05/2021	689942	7998198	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland.			0
EcoLogical		2021 6/03/2021	692110	7997908	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Carcharus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.			0
EcoLogical		2021 6/03/2021	692546	7997874	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Carcharus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.			0
EcoLogical		2021 9/03/2021	692598	7997881	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Carcharus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.			0
EcoLogical		2021 9/03/2021	692853	7997861	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Carcharus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.			0
EcoLogical		2021 9/03/2021	693108	7997839	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CbEc	*Corymbia bella , Eucalyptus coolabah* mid open woodland over *Acacia colei , Lophostemon grandiflorus* subsp. *riparius , Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse grassland			0
EcoLogical		2021 9/03/2021	693720	7997803	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland			0
EcoLogical		2021 9/03/2021	694001	7997454	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland			0
EcoLogical		2021 25/05/2021	695406	7996200	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland			0
EcoLogical		2021 25/05/2021	695254	7994817	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgCzBc	*Corymbia greeniana , Corymbia zygophylla , Bauhinia cunninghamii* low open woodland over *Acacia platycarpa , Grevillea pyramidalis , Atalaya hemiglauca* tall sparse shrubland over *Sorghum plumosum , Sorghum stipoides* tall open tussock grassland and *Aristida latifolia* mid sparse tussock grassland.			0
EcoLogical		2021 25/05/2021	693266	7993507	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgCzBc	*Corymbia greeniana , Corymbia zygophylla , Bauhinia cunninghamii* low open woodland over *Acacia platycarpa , Grevillea pyramidalis , Atalaya hemiglauca* tall sparse shrubland over *Sorghum plumosum , Sorghum stipoides* tall open tussock grassland and *Aristida latifolia* mid sparse tussock grassland.			0
EcoLogical		2021 26/05/2021	690482	7993326	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgBc	*Adansonia gregorii* mid isolated trees and *Bauhinia cunninghamii* low open woodland over *Grevillea pyramidalis , Hakea arborescens , Hakea macrocarpa* tall sparse shrubland over *Indigofera colutea* low sparse shrubland, *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 26/05/2021	687949	7993198	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgCzBc	*Corymbia greeniana , Corymbia zygophylla , Bauhinia cunninghamii* low open woodland over *Acacia platycarpa , Grevillea pyramidalis , Atalaya hemiglauca* tall sparse shrubland over *Sorghum plumosum , Sorghum stipoides* tall open tussock grassland and *Aristida latifolia* mid sparse tussock grassland.			0
EcoLogical		2021 26/05/2021	687755	7992990	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgBc	*Adansonia gregorii* mid isolated trees and *Bauhinia cunninghamii* low open woodland over *Grevillea pyramidalis , Hakea arborescens , Hakea macrocarpa* tall sparse shrubland over *Indigofera colutea* low sparse shrubland, *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 26/05/2021	686909	7992992	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland			0
EcoLogical		2021 9/03/2021	685643	7992721	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcCg	*Bauhinia cunninghamii , Corymbia greeniana* low open woodland over *Hakea macrocarpa , Grevillea pyramidalis , Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.			0
EcoLogical		2021 9/03/2021	685634	7991962	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcCg	*Bauhinia cunninghamii , Corymbia greeniana* low open woodland over *Hakea macrocarpa , Grevillea pyramidalis , Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.			0
EcoLogical		2021 9/03/2021	685626	7991575	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcCg	*Bauhinia cunninghamii , Corymbia greeniana* low open woodland over *Hakea macrocarpa , Grevillea pyramidalis , Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.			0
EcoLogical		2021 9/03/2021	689918	7985266	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcTc	*Bauhinia cunninghamii , Terminalia canescens* low open woodland over *Grevillea pyramidalis , Acacia ancistrocarpa , Acacia colei* tall sparse shrubland over *Triodia intermedia , Triodia bitextura* low sparse hummock grassland and *Sorghum plumosum* tall open tussock grassland.			0
EcoLogical		2021 9/03/2021	690616	7985383	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcTc	*Bauhinia cunninghamii , Terminalia canescens* low open woodland over *Grevillea pyramidalis , Acacia ancistrocarpa , Acacia colei* tall sparse shrubland over *Triodia intermedia , Triodia bitextura* low sparse hummock grassland and *Sorghum plumosum* tall open tussock grassland.			0
EcoLogical		2021 8/03/2021	691284	7985129	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcTc	*Bauhinia cunninghamii , Terminalia canescens* low open woodland over *Grevillea pyramidalis , Acacia ancistrocarpa , Acacia colei* tall sparse shrubland over *Triodia intermedia , Triodia bitextura* low sparse hummock grassland and *Sorghum plumosum* tall open tussock grassland.			0
EcoLogical		2021 9/03/2021	692961	7985886	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgBc	*Adansonia gregorii* mid isolated trees and *Bauhinia cunninghamii* low open woodland over *Grevillea pyramidalis , Hakea arborescens , Hakea macrocarpa* tall sparse shrubland over *Indigofera colutea* low sparse shrubland, *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 27/05/2021	694977	7985901	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgBc	*Adansonia gregorii* mid isolated trees and *Bauhinia cunninghamii* low open woodland over *Grevillea pyramidalis , Hakea arborescens , Hakea macrocarpa* tall sparse shrubland over *Indigofera colutea* low sparse shrubland, *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 9/03/2021	696524	7985668	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	Ag	*Adansonia gregorii* mid open woodland over *Grevillea pyramidalis , Hakea chordophylla , Dolichandrone occidentalis* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall sparse tussock grassland and *Aristida holathera* low sparse grassland.			0
EcoLogical		2021 27/05/2021	697659	7986009	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AtAcDo	*Atalaya hemiglauca , Acacia synchronicia , Dolichandrone occidentalis* tall sparse shrubland over *Carissa lanceolata , Gossypium australe , Chamaecrista symonii* low sparse shrubland over *Triodia intermedia , Triodia wiseana* low hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 9/03/2021	699041	7985804	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	Ag	*Bauhinia cunninghamii , Corymbia greeniana* low open woodland over *Hakea macrocarpa , Grevillea pyramidalis , Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.			0
EcoLogical		2021 26/05/2021	688934	7980819	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AtAcDo	*Atalaya hemiglauca , Acacia synchronicia , Dolichandrone occidentalis* tall sparse shrubland over *Carissa lanceolata , Gossypium australe , Chamaecrista symonii* low sparse shrubland over *Triodia intermedia , Triodia wiseana* low hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 26/05/2021	690150	7979852	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AtAcDo	*Atalaya hemiglauca , Acacia synchronicia , Dolichandrone occidentalis* tall sparse shrubland over *Carissa lanceolata , Gossypium australe , Chamaecrista symonii* low sparse shrubland over *Triodia intermedia , Triodia wiseana* low hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 26/05/2021	692240	7980547	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AtAcDo	*Atalaya hemiglauca , Acacia synchronicia , Dolichandrone occidentalis* tall sparse shrubland over *Carissa lanceolata , Gossypium australe , Chamaecrista symonii* low sparse shrubland over *Triodia intermedia , Triodia wiseana* low hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 27/05/2021	692645	7980711	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AtAcDo	*Atalaya hemiglauca , Acacia synchronicia , Dolichandrone occidentalis* tall sparse shrubland over *Carissa lanceolata , Gossypium australe , Chamaecrista symonii* low sparse shrubland over *Triodia intermedia , Triodia wiseana* low hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 9/03/2021	694543	7981096	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcCg	*Bauhinia cunninghamii , Corymbia greeniana* low open woodland over *Hakea macrocarpa , Grevillea pyramidalis , Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.			0
EcoLogical		2021 7/03/2021	696593	7980098	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	Ag	*Bauhinia cunninghamii , Corymbia greeniana* low open woodland over *Hakea macrocarpa , Grevillea pyramidalis , Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.			0
EcoLogical		2021 7/03/2021	697909	7980047	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	Ag	*Bauhinia cunninghamii , Corymbia greeniana* low open woodland over *Hakea macrocarpa , Grevillea pyramidalis , Acacia colei* tall sparse shrubland over *Triodia intermedia* low sparse hummock grassland, *Sorghum plumosum* tall open tussock grassland and *Eragrostis eriopoda* low sparse tussock grassland.			0
EcoLogical		2021 7/03/2021	701517	7980279	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgCgEc	*Adansonia gregorii* mid isolated trees and *Corymbia greeniana, Erythrophleum chlorostachys, Bauhinia cunninghamii* low open woodland over *Acacia colei, Grevillea pyramidalis, Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low open hummock grassland and *Sorghum plumosum, Chrysopogon fallax* tall open tussock grassland.			0
EcoLogical		2021 7/03/2021	702048	7980340	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	AgCgEc	*Adansonia gregorii* mid isolated trees and *Corymbia greeniana, Erythrophleum chlorostachys, Bauhinia cunninghamii* low open woodland over *Acacia colei, Grevillea pyramidalis, Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low open hummock grassland and *Sorghum plumosum, Chrysopogon fallax* tall open tussock grassland.			0
EcoLogical		2021 8/03/2021	704590	7982476	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcGaCg	*Bauhinia cunninghamii, Gyrocarpus americanus, Corymbia greeniana* low open woodland over *Acacia platycarpa , Acacia tumida* tall open shrubland and *Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low sparse hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 8/03/2021	704483	7981302	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland			0
EcoLogical		2021 8/03/2021	704492	7980578	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcGaCg	*Bauhinia cunninghamii, Gyrocarpus americanus, Corymbia greeniana* low open woodland over *Acacia platycarpa , Acacia tumida* tall open shrubland and *Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low sparse hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 8/03/2021	705136	7980954	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CgAgBc	*Corymbia greeniana , Adansonia gregorii* mid open woodland and *Bauhinia cunninghamii* low open woodland over *Acacia colei , Hakea arborescens , Hakea chordophylla* tall sparse shrubland over *Sorghum plumosum* tall open tussock grassland and *Eriachne obtusa , Aristida hygrometrica* low sparse grassland			0
EcoLogical		2021 8/03/2021	706410	7981270	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CbEc	*Corymbia bella , Eucalyptus coolabah* mid open woodland over *Acacia colei , Lophostemon grandiflorus* subsp. *riparius , Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse grassland			0
EcoLogical		2021 8/03/2021	707228	7981171	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EcCg	*Erythrophleum chlorostachys, Corymbia greeniana* low open woodland over *Acacia tumida , Acacia ancistrocarpa* tall sparse shrubland and *Carissa lanceolata* mid sparse shrubland over *Bonamia pannosa , Bonamia linearis* low sparse shrubland and *Aristida hygrometrica* low open grassland.			0
EcoLogical		2021 8/03/2021	708001	7981195	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EcCg	*Erythrophleum chlorostachys, Corymbia greeniana* low open woodland over *Acacia tumida , Acacia ancistrocarpa* tall sparse shrubland and *Carissa lanceolata* mid sparse shrubland over *Bonamia pannosa , Bonamia linearis* low sparse shrubland and *Aristida hygrometrica* low open grassland.			0
EcoLogical		2021 8/03/2021	708693	7980594	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CzEcCg	*Corymbia zygophylla , Erythrophleum chlorostachys , Corymbia greeniana* low open woodland over *Acacia tumida , Acacia platycarpa* tall sparse shrubland and *Waltheria indica* low sparse shrubland over *Triodia bitextura , Triodia wiseana* low open hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 8/03/2021	708722	7979400	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcGaCg	*Bauhinia cunninghamii, Gyrocarpus americanus, Corymbia greeniana* low open woodland over *Acacia platycarpa , Acacia tumida* tall open shrubland and *Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low sparse hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 7/03/2021	708773	7978101	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CzEcCg	*Corymbia zygophylla , Erythrophleum chlorostachys , Corymbia greeniana* low open woodland over *Acacia tumida , Acacia platycarpa* tall sparse shrubland and *Waltheria indica* low sparse shrubland over *Triodia bitextura , Triodia wiseana* low open hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 7/03/2021	709731	7978391	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EcCg	*Erythrophleum chlorostachys, Corymbia greeniana* low open woodland over *Acacia tumida , Acacia ancistrocarpa* tall sparse shrubland over *Bonamia pannosa , Bonamia linearis* low sparse shrubland and *Aristida hygrometrica* low open grassland.			0
EcoLogical		2021 7/03/2021	711252	7978417	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EcCg	*Erythrophleum chlorostachys, Corymbia greeniana* low open woodland over *Acacia tumida , Acacia ancistrocarpa* tall sparse shrubland and *Carissa lanceolata* mid sparse shrubland over *Bonamia pannosa , Bonamia linearis* low sparse shrubland and *Aristida hygrometrica* low open grassland.			0
EcoLogical		2021 7/03/2021	712051	7978400	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	EmEcAg	*Eucalyptus microtheca, Eucalyptus camaldulensis, Adansonia gregorii* tall open woodland and *Bauhinia cunninghamii, Atalaya hemiglauca* low open woodland over *Acacia colei, Terminalia platyphylla, *Vachellia farnesiana* tall open shrubland over *Carcharus fascicularis* low sparse shrubland and *Aristida latifolia, Sehima nervosum* tall open tussock grassland.			0
EcoLogical		2021 7/03/2021	713211	7978357	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CbEc	*Corymbia bella , Eucalyptus coolabah* mid open woodland over *Acacia colei , Lophostemon grandiflorus* subsp. *riparius , Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse			0
EcoLogical		2021 7/03/2021	713276	7978347	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CbEc	*Corymbia bella , Eucalyptus coolabah* mid open woodland over *Acacia colei , Lophostemon grandiflorus* subsp. *riparius , Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse			0
EcoLogical		2021 7/03/2021	713620	7978355	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CbEc	*Corymbia bella , Eucalyptus coolabah* mid open woodland over *Acacia colei , Lophostemon grandiflorus* subsp. *riparius , Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse			0
EcoLogical		2021 27/05/2021	711942	7976870	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CzEcCg	*Corymbia zygophylla , Erythrophleum chlorostachys , Corymbia greeniana* low open woodland over *Acacia tumida , Acacia platycarpa* tall sparse shrubland and *Waltheria indica* low sparse shrubland over *Triodia bitextura , Triodia wiseana* low open hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 27/05/2021	713616	7976552	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CzEcCg	*Corymbia zygophylla , Erythrophleum chlorostachys , Corymbia greeniana* low open woodland over *Acacia tumida , Acacia platycarpa* tall sparse shrubland and *Waltheria indica* low sparse shrubland over *Triodia bitextura , Triodia wiseana* low open hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 27/05/2021	715782	7976497	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CzEcCg	*Corymbia zygophylla , Erythrophleum chlorostachys , Corymbia greeniana* low open woodland over *Acacia tumida , Acacia platycarpa* tall sparse shrubland and *Waltheria indica* low sparse shrubland over *Triodia bitextura , Triodia wiseana* low open hummock grassland and *Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 4/03/2021	716840	7976435	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcGaCg	*Bauhinia cunninghamii, Gyrocarpus americanus, Corymbia greeniana* low open woodland over *Acacia platycarpa , Acacia tumida* tall open shrubland and *Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low sparse hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 4/03/2021	717133	7977000	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	BcGaCg	*Bauhinia cunninghamii, Gyrocarpus americanus, Corymbia greeniana* low open woodland over *Acacia platycarpa , Acacia tumida* tall open shrubland and *Carissa lanceolata* mid sparse shrubland over *Triodia bitextura* low sparse hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse grassland.			0
EcoLogical		2021 4/03/2021	716838	7977401	Targeted Flora and Veg Survey	*Nymphoides beaglensis*	9	128.51	14	CbEc	*Corymbia bella , Eucalyptus coolabah* mid open woodland over *Acacia colei , Lophostemon grandiflorus* subsp. *riparius , Sesbania cannabina* tall sparse shrubland over *Triodia bitextura* low open hummock grassland and *Aristida hygrometrica , Eriachne obtusa* low sparse			0
Woodman Environmental Consulting		2007 18/04/2007	687158	8001189	Campsite Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampierii* over Grassland of *Aristida holothera var. holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0

BNR Desktop Review of Historical Flora and Vegetation Surveys within Exploration Permit 371(2007-2021)

Company	Publish Date	Date	Easting / Long	Northing / Lat	Survey Type	Priority Flora	Weeds / Introduced Flora	Total Area Surveyed (ha)	Number of Veg Communities	Veg Community Name	Veg Community Description	Veg Reference	Priority Fauna	TECs Present
Woodman Environmental Consulting	2007	18/04/2007	687164	8001161	Campsite Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampieriii* over Grassland of *Aristida holothera* var. *holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0
Woodman Environmental Consulting	2007	18/04/2007	687201	8001151	Campsite Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampieriii* over Grassland of *Aristida holothera* var. *holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0
Woodman Environmental Consulting	2007	18/04/2007	687182	8001212	Campsite Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampieriii* over Grassland of *Aristida holothera* var. *holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0
Woodman Environmental Consulting	2007	18/04/2007	687190	8001071	Well Site Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampieriii* over Grassland of *Aristida holothera* var. *holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0
Woodman Environmental Consulting	2007	18/04/2007	687153	8000923	Well Site Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampieriii* over Grassland of *Aristida holothera* var. *holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0
Woodman Environmental Consulting	2007	18/04/2007	687283	8000957	Well Site Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampieriii* over Grassland of *Aristida holothera* var. *holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0
Woodman Environmental Consulting	2007	18/04/2007	687263	8001068	Well Site Survey	0	N/A	108	27	Open Woodland (W1)	Open Woodland of *Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* with occasional *Corymbia dampieriii* over Grassland of *Aristida holothera* var. *holothera* and *Eriachne obtusa* with occasional shrub and herbaceous species on brown silt on plain			0
Outback Ecology	2014	17/11/2012	681471	8003803	Eden 1	0	N/A	108	27	Not Explicit - Scattered Low Trees	*Corymbia greeniana* and *Bauhinia cunninghamii* Scattered Low Trees over *Chrysopogon fallax* Open Tussock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	681532	8000656	Eden 2	0	N/A	108	27	Not Explicit - Low Open Woodland	*Corymbia greeniana* Low Open Woodland over *Aristida? inaequiglumis* and *Sorghum plumosum* Closed Tussock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	681361	7994207	Eden 3	0	N/A	108	27	Not Explicit - Trees over Acacia tumida	Trees over *Acacia tumida?* Scattered Shrubs over *?Enteropogon ramosus* and *Chrysopogon fallax* Tussock Grassland. *Corymbia flavescens* Scattered Low Trees over *Chrysopogon fallax* Open Tussock Grassland.		N/A	0
Outback Ecology	2014	17/11/2012	675315	8001171	Eden 4	0	N/A	108	27	Not Explicit - Scattered Low Trees	*Corymbia greeniana* Scattered Low Trees over *Chrysopogon fallax* Open Tussock Grassland		*Ardeotis australis*	0
Outback Ecology	2014	17/11/2012	679524	7995677	Eden 6	0	N/A	108	27	Not Explicit - Tall Shrubland	*Acacia ancistrocarpa* Tall Shrubland over *Digitaria sp.* Tussock Grassland and *Triodia ?wiseana* Open Hummock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	686496	8004817	Eden 7	0	N/A	108	27	Not Explicit - Woodland	Woodland over *Chrysopogon fallax* Open Tussock Grassland and *Triodia sp.* Very Open Tussock to Tussock Grassland (in patches)		N/A	0
Outback Ecology	2014	17/11/2012	675863	8019070	Ellendale 1	0	N/A	108	27	Not Explicit - Scattered Low Trees	*Corymbia flavescens* and *Bauhinia cunninghamii* Scattered Low Trees over *Acacia colei var. colei* and *Grevillea pyramidalis* Tall Open Shrubland		N/A	0
Outback Ecology	2014	17/11/2012	684787	8018524	Ellendale 3	0	N/A	108	27	Not Explicit - Scattered Low Trees	*Corymbia sp.* and *Bauhinia cunninghamii* Scattered Low Trees over (40% plus cover prior to the fire) *Acacia colei* Tall Open Scrub over *Chrysopogon fallax* (approximately 30% cover prior to fire) Open Tussock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	668457	8009092	Ophir Well	0	N/A	108	27	Not Explicit - Low Open Woodland	*Bauhinia cunninghamii*, *Corymbia flavescens* and *Adansonia gregorii* Low Open Woodland over *Grevillea pyramidalis* Scattered Shrubs over *Chrysopogon fallax* and *Aristida inaequiflumis* Open Tussock Grassland. & *Bauhinia cunninghamii*, *Corymbia flavescen s* and *Adansonia gregorii* Low Open Woodland over *Grevillea pyramidalis* Scattered Shrubs over *Chrysopogon fallax* and *Aristida inaequiflumis* Open Tussock Grassland. Dense patches of *Melaleuca* sp.		*Ardeotis australis*	0
Outback Ecology	2014	17/11/2012	663935	8011161	Paradise East 1	0	*Stylosanthes sp.*	108	27	Not Explicit - Scattered Tall Shrubs	*Acacia ancistrocarpa* Scattered Tall Shrubs over *Triodia ?epactia* Closed Hummock Grassland.		N/A	0
Outback Ecology	2014	17/11/2012	662161	8007232	Paradise East 2	0	N/A	108	27	Not Explicit - Scattered Low Trees	*Corymbia cadophora, C. opaca, Bauhinia cunninghamii* Scattered Low Trees over *Acacia monticola* and *A. synchronica* Scattered Tall Shrubs.		N/A	0
Outback Ecology	2014	17/11/2012	666529	8008824	Paradise East 3	0	N/A	108	27	Not Explicit - Scattered Low Trees	*Adansonia gregorii* and *Bauhinia cunninghamii* Scattered Low Tree over *Chrysopogon fallax* Tussock Grassland and *Triodia sp.* Open Hummock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	669214	8003444	Paradise East 4	0	*Cucumis ? Melo*	108	27	Not Explicit - Low Open Woodland	*Corymbia sp.* Low Open Woodland over *Acacia monticola* and *Acacia colei* Tall Open Shrubland over *Triodia schinzii* Hummock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	665202	8009268	Paradise East 8	0	N/A	108	27	Not Explicit - Scattered Low Woodland	*Corymbia greeniana* Scattered Low Woodland over *Hibiscus austrinus var. austrinus* Scattered Shrubs over Chrysopogon fallax Tussock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	656975	8008703	Paradise West 1	0	N/A	108	27	Not Explicit - Tall Open Shrubland	*Acacia tumida* Tall Open Shrubland over *Triodia sp.* Hummock Grassland and *Cymbopogon ambiguus* Very Open Tussock Grassland		*Merops ornatus*	0
Outback Ecology	2014	17/11/2012	653150	8008518	Paradise West 2	0	N/A	108	27	Not Explicit - Tall Shrubland	*Acacia ?colei* Tall Shrubland over Triodia sp. Open Hummock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	661846	8000934	Paradise West 3	0	*Xanthium strumarium*	108	27	Not Explicit - Low Open Woodland	*Bauhinia cunninghamii* Low Open Woodland over *Carissa lanceolata* and *Gossypium australe* Tall Open Shrubland over Triodia ?epactia Scattered Hummock Grassland to Hummock Grassland		Burhinus grallarius	0
Outback Ecology	2014	17/11/2012	651509	8000624	Paradise West 4	0	*Parkinsonia aculeata*	108	27	Not Explicit - Scattered Low Trees	*Eucalyptus sp.* and *Adansonia gregorii* Scattered Low Trees over *Acacia monticola* and *A. colei* Tall Open Scrub (pre fire) over *Triodia ?epactia* Open Tussock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	658261	8001892	Paradise West 5	0	*Stylosanthes sp.*	108	27	Not Explicit - Hummock Grassland	*Triodia ?epactia* Hummock Grassland		*Ardea madasta* and *Merops ornatus* and *Tringa stagnatilis*	0
Outback Ecology	2014	17/11/2012	656046	8003642	Paradise West 6	0	N/A	108	27	Not Explicit - Tall Shrubland	*Acacia colei, Gossypium australe* and *Grevillea pyramidalis* Tall Shrubland to Tall Open Scrub over *Triodia epactia* Hummock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	655498	8013034	Paradise West 8	0	N/A	108	27	Not Explicit - Tall Open Shrubland	*Acacia eriopoda* Tall Open Shrubland over *Chrysopogon fallax* Open Tussock Grassland and *Triodia ?epactia* Open Hummock Grassland to Hummock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	686141	8001639	Valhalla 1	0	N/A	108	27	Not Explicit - Low Open Woodland	*Corymbia ?flavescens* Low Open Woodland over *Aristida ?inaequiglumis* , *Chrysopogon fallax* and *Eriachne sp.* Tussock Grassland and *Triodia sp* . Very Open Hummock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	695595	8003148	Valhalla 2	0	N/A	108	27	Not Explicit - Tall Open Woodland	*Corymbia ?flavescens* Tall Open Woodland over *Acacia colei* Tall Open Shrubland over *Triodia ?epactia* Very Open Hummock Grassland and *Chrysopogon fallax* Very Open Tussock Grassland		N/A	0
Outback Ecology	2014	17/11/2012	690276	7999424	Valhalla 3	0	*Stylosanthes sp.*	108	27	Not Explicit - Scattered Low Trees	*Corymbia ?flavescens* Scattered Low Trees over *Hakea chordophylla* Scattered Tall Shrubs over *Chrysopogon fallax* Tussock Grassland		N/A	0
EcoLogical	2017	11/11/2016	694985	7973857	Valhalla Central A	0	N/A	N/A	4	AgBcTi	Adansonia gregorii scattered low trees over Bauhinia cunninghamii and Hakea chordophylla tall open shrubland over Triodia intermedia open hummock grassland and Eriachne obtusa open tussock grassland	Beard / Shepherd	*Merops ornatus*	0
EcoLogical	2017	11/11/2016	694985	7973857	Valhalla Central A	0	N/A	N/A	4	AgHcCiBcTeEc	Adansonia gregorii scattered low trees over Hakea chordophylla tall open shrubland over Carissa lanceolata scattered shrubs over Bauhinia cunninghamii and Gossypium australe scattered low shrubs over Triodia epactia hummock grassland and Eriachne ?ciliata and Sorghum plumosum scattered tussock grasses	Beard / Shepherd	*Merops ornatus*	0
EcoLogical	2017	11/11/2016	694985	7973857	Valhalla Central A	0	N/A	N/A	4	CgHcSpTiGc	Corymbia greeniana low open woodland over Hakea chordophylla and Hakea macrocarpa scattered tall shrubs over Sorghum plumosum tussock grassland over Triodia intermedia scattered hummock grasses over Gomphrena canescens, Crotalaria medicaginea and Crotalaria ramosissima scattered herbs	Beard / Shepherd	*Merops ornatus*	0
EcoLogical	2017	11/11/2016	694985	7973857	Valhalla Central A	0	N/A	N/A	4	CgBcApSp	Corymbia greeniana scattered low trees over Bauhinia cunninghamii, Acacia platycarpa and Crotalaria cunninghamii tall shrubland over Sorghum plumosum, Eragrostis eriopoda and Eriachne obtusa tussock grassland	Beard / Shepherd	*Merops ornatus*	0
Murdoch University	2016	14/09/2016	694310	7992800	Bilby Survey at Valhalla Central	0	N/A	N/A	1	Not Explicit - Savanna grassland	Savanna grassland, consisting of an open grassland understory, dominated by *Triodia spp., Aristida spp., Sorghum spp., and Chrysopogon spp.* , and a sparse overstorey, dominated by *Eucalypt spp., and Corymbia spp.* Some sparsely located *Bauhinia cunninghamii* , and *Adansonia gregorii* were also found	N/A	N/A	0
EcoLogical	2018	24/05/2018	689310	7998098	Valhalla Central 4 Survey	0	N/A	N/A	1	CgEcOW	*Corymbia greeniana* and *Eucalyptus coolabah* open woodland over *Acacia colei, Hakea arborescens* and *H. chordophylla* sparse shrubland over *Triodia ?schinzii* open hummock grassland over *Sorghum stipoidirum* and *Eriachne obtusa* tussock grassland.	Beard / Shepherd	N/A	0
Low Ecological Services	2011	25/08/2011	691813	8002857	Valhalla East-01 Exploration Well	0	*Stylosantheses hamata*	N/A	1	Not Explicit - Open Pindan Woodland	Open pindan woodland, with an overstorey of *Bauhinia cunninghammii, Gyrocarpus americanus Atalaya hemiglauca* and *Adansonia gibbosa* , an upper shrub layer dominated by *Acacia* spp. and *Bauhinia cunninghammii* , and a lower shrub layer of *Cassia lanceolata* , *Solanum sp.*, and *Ptilotus sp* .	N/A	N/A	0
Low Ecological Services	2011	24/10/2011	683111	8006106	Valhalla North	0	N/A	N/A	1	Not Explicit - Open Shrubland	Open shrubland of primarily *Grevillea spp* , with the occasional *Acacia sp* . and scattered trees, over hummock grassland	N/A	N/A	0
Low Ecological Services	2012	17/04/2021	714725	7981294	Asgard-1 Exploration Well	0	*Cucumis argenteus*	N/A	1	Not Explicit - Open Woodland	Vegetation type was open woodland over tussock and hummock grasses. The upperstorey consisted of *Bauhinia cunninghammi* , *Gyrocarpus americanum* and *Corymbia zygophylla* to 4m. The midstorey consisted of *Dolichandrone heterophylla* . The understorey consisted of *Sorghum stipodrum* , *Triodia schinzii* , *Aristida* spp. and a variety of forbs.			
Low Ecological Services	2012	19/04/2012			Asgard 2D Seismic Survey	0	N/A	N/A	1					
Low Ecological Services	2020	25/11/2019			Odin 2D and 3D Seismic Survey	0	*Calotropis procera* and *Cenchrus ciliaris*	N/A	1					

Appendix E. Valhalla Environmental Monitoring Program

Valhalla Gas Exploration and Appraisal Program

Valhalla Monitoring Plan

BNR_HSE_MP_016

VERSION HISTORY				
Ver. No.	**Ver. Date**	**Author**	**Reviewer**	**Revision**
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Acronym / abbreviation

Terms / acronym	Definition / expansion
AER	Annual Environmental Report
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
BNR	Bennett Resources Pty Ltd
BTEXN	Compounds found in crude oil, including Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene
DDG	Dust deposition gauge
DEMIRS	(WA) Department of Energy, Mining, Industrial Relations and Safety (formerly DMIRS)
e.g.	For example
EP 371	Exploration Permit 371
EP Act	(WA) Environmental Protection Act 1986
EPA	(WA) Environmental Protection Authority
ERD	Environmental Review Document
HFS	Hydraulic Fracture Stimulation
i.e.	That is
km	Kilometres
km^2	Square kilometres
LOR	Limit of reporting
m	Metres
NEPC	National Environment Protection Council
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
Proposal	Valhalla Gas Exploration and Appraisal Program
QA/QC	Quality Assurance / Quality Control
VMP	Valhalla Monitoring Plan
WA	Western Australia
WHO	World Health Organization
~	Approximately

1 Summary

This Valhalla Monitoring Plan (VMP) has been prepared by Bennett Resources (BNR) to support the assessment, approval, and implementation of the Valhalla Gas Exploration and Appraisal Program (the Proposal) under Part IV of the *Environmental Protection Act 1986* (EP Act). With the exception of groundwater quality, this VMP presents information for all monitoring scopes proposed for the Proposal, specifically soil quality, air quality, methane emissions and Naturally Occurring Radioactive Material (NORM). The groundwater quality monitoring scope, criteria, indicators and relevant management measures have been presented in the BNR Groundwater Management Plan (BNR_HSE_MP_015) included in the Proposal's Environmental Review Document (ERD) (BNR_HSE_MP_013).

Bennett Resources referred the Proposal to the Environmental Protection Authority (EPA) under Part IV of the EP Act on 24 December 2020 (EPA Assessment Number 2281). The EPA set the level of assessment for the Proposal as Public Environmental Review. The ERD is to include environmental impact assessment and management information, including this VMP which will be subject to an 8-week public review period.

A summary of the VMP is provided in Table 1-1.

Table 1-1: Summary of the Proposal and associated Valhalla Monitoring Plan

Proposal title	Valhalla Gas Exploration and Appraisal Program (EPA Assessment Number 2281)
Proponent name	Bennett Resources Pty Ltd
Ministerial Statement number	The Proposal is currently being assessed by the EPA (Assessment 2281) and a Ministerial Statement and associated proposal implementation conditions are yet to be issued.
Purpose of the VMP	The purpose of this VMP is to detail the monitoring requirements along with response actions for trigger and threshold criteria that are required to be implemented for the duration of the Proposal.
EPA key environmental factors and objectives, and VMP outcomes	**Soil quality monitoring program** Terrestrial Environmental Quality – EPA Objective: *To maintain the quality of land and soils so that environmental values are protected.* VMP outcomes: No short or long-term adverse impacts to soil quality. **Air quality monitoring program** Air Quality – EPA Objective: *To maintain air quality and minimise emissions so that environmental values are protected.* VMP outcomes: No short or long-term adverse impacts to air quality. **Methane emissions monitoring program:** Methane Emissions – EPA Objective: *To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.* VMP outcomes: No short or long-term adverse impacts to air quality. **NORM monitoring program** Human Health – EPA Objective: *To protect human health from significant harm.* VMP outcomes: No short or long-term adverse impacts to human health.
Key components in the VMP	The key provisions of this VMP are, where relevant: • localised baseline monitoring • activity monitoring • surveillance monitoring • trigger and threshold criteria and subsequent response actions • annual reporting (including results of monitoring).

Proposed commencement date	TBC
VMP required pre-construction ?	Yes ☐ No ☒

2 Context, scope and rational

2.1 Proposal

The Proposal is to complete an unconventional exploration and appraisal drilling and Hydraulic Fracture Stimulation (HFS) program within Petroleum Exploration Permit EP 371 (EP 371) in the Canning Basin, within the Shire of Derby / West Kimberley in Western Australia (WA). The intent of the Proposal is to evaluate the large tight gas resource in the region which has the potential to offer long-term energy security to Australia. The onshore Canning Basin is an early Ordovician to early Cretaceous aged geological basin that covers approximately 430,000 km^2 in the West Kimberley region. The Proposal is targeting hydrocarbons present from the Laurel through to the Devonian Formations, ranging from 2,000 m to 5,000 m below ground level. The main target is the Laurel Formation, with hydrocarbons present at depths between 2,000 m and 4,000 m below ground level. Table 2-1 provides a summary of the proposal.

Table 2-1: Summary of the Proposal

Proposal title	Valhalla Gas Exploration and Appraisal Program
Proponent name	Bennett Resources Pty Ltd (BNR)
Short description	The Proposal is to undertake an unconventional exploration and appraisal drilling program within EP 371, located in the Canning Basin, West Kimberley of Western Australia. The Proposal involves constructing up to 20 exploration wells within 10 well sites. The intent of the Proposal is to further explore and appraise the extent of the tight gas reservoirs present from the Laurel through to the Devonian Formations, at depths ranging from 2,000 m to 5,000 m below ground level. The total area of the physical disturbance footprint for the Proposal is ~112 ha, including some previously disturbed areas and proposed clearing. The estimated maximum amount of clearing for the Proposal is ~110 ha and comprises: • well sites ~40.1 ha • access Tracks ~59.1 ha • camps ~2.8 ha. The exploration and appraisal program are expected to commence in 2024.

2.2 Key environmental factors

Several activities have been identified as having the potential to affect key environmental factors. There have been summarised in the tables below for each relevant EPA factor.

Table 2-2: Summary of key environmental factor – Terrestrial Environmental Quality

EPA objective	To maintain the quality of land and soils so that environmental values are protected.
Policy and guidance	• Environmental Key Factor Guideline – Terrestrial Environmental Quality (EPA 2016a) • National Environment Protection Council (NEPC) (1999). Assessment of Site Contamination Measure (NEPM), Schedule B (1) – Guideline on the Investigation Levels for Soil and Groundwater (NEPC 1999)
Project activities	• site preparations, including ground disturbance • drilling • gas exploration method (unconventional)
Environmental values / receptors	• pastoral station (existing land-use)
Potential impacts – direct impacts	N/A
Potential impacts – indirect impacts	• erosion or scouring from a reduction in soil stability during civil works • inadequate rehabilitation arising from compaction.

	• contamination of land and soils from surface spills.

Table 2-3: Summary of key environmental factor – Air Quality

EPA objective	To maintain air quality and minimise emissions so that environmental values are protected.
Policy and guidance	• Environmental Key Factor Guideline – Air Quality (EPA 2021) • Environmental Protection Act 1986 (WA) • NEPC National Environment Protection (Ambient Air Quality) Measure (NEPM) (NEPC 2016) • National Environment Protection (Air Toxics) Measure (NEPC 2004)
Project activities	• site preparation and site reinstatement • well drilling • well testing
Environmental values / receptors	• local airshed • local Aboriginal communities – Yungngora and Jimbalakudunj Communities.
Potential impacts – direct impacts	N/A
Potential impacts – indirect impacts	• reduction in air quality causing impacts to sensitive social receptors • increased dust generation resulting in deposition impacts to flora and vegetation.

Table 2-4: Summary of key environmental factor – GHG Emissions

EPA objective	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.
Policy and guidance	• Environmental Key Factor Guideline – Greenhouse Gas Emissions (EPA 2020) • Environmental Protection Act 1986 (WA) (EP Act) • National Greenhouse and Energy Reporting Act 2007 (NGER Act) (Commonwealth).
Project activities	• land clearing • fuel usage during all activities • flaring during well testing • fugitive emissions.
Environmental values / receptors	• local airshed
Potential impacts – direct impacts	• contribution to GHG emissions.
Potential impacts – indirect impacts	N/A

Table 2-5: Summary of key environmental factor – Human Health

EPA objective	To protect human health from significant harm.
Policy and guidance	• Environmental Key Factor Guideline – Human Health (EPA 2016b).
Project activities	• well drilling • well testing
Environmental values / receptors	• local soil quality • local airshed • human receptors in the surrounds of the well sites

Potential impacts – direct impacts	• industrial processes that result in the build-up and release of radioactive substances or emissions.
Potential impacts – indirect impacts	N/A

2.3 Condition requirements

The Proposal is currently being assessed by the EPA (Assessment 2281) and a Ministerial Statement and associated proposal implementation conditions are yet to be issued.

2.4 Rationale and approach

2.4.1 Environmental outcomes

The overall purpose of this VMP is to quantify the potential environmental impacts and risks associated with the Proposal activities. In meeting this objective, BNR will be able to verify the outcomes of the ERD which state that the impacts and risks are not significant given the manner in which the Proposal is planned to be implemented.

Based upon the monitoring programs selected for the Proposal, an outcome-based approach has been selected given the ability to collect quantitative data that enables unbiased scientific analysis to be completed. Further to this, quantitative environmental and health indicators exist for the environmental factors detailed in this plan, enabling outcomes to be selected for the Proposal.

Consequently, the following outcomes have been defined for this VMP:

- no short or long-term adverse impacts to soil quality
- no short or long-term adverse impacts to air quality
- no short or long-term adverse impacts to human health.

2.4.2 Key assumptions and uncertainty

A number of assumptions have been made and uncertainties observed in the development of this VMP. These are detailed in Table 2-6.

Table 2-6: Assumptions and uncertainties

Regulatory uncertainty	Since the lifting of the moratorium into HFS, the Proposal is the first project that is subject to assessment under the EP Act under the new provisions. Given the project is the first of its kind post moratorium, there is uncertainty regarding EPA and WA government expectations for the project. This has been managed as best as possible through engagement with various government departments and through implementing a conservative monitoring approach (detailed in this VMP).
Code of Practice for HFS activities has not yet been completed	BNR understands that the Code of Practice, which is not currently publicly available, will contain more detail around the monitoring requirements for unconventional oil and gas projects. However, in the absence of the Code of Practice, BNR has tried to manage the uncertainty and assumptions in the development of this VMP following various engagements with different decision-making authorities (DMAs) and subject matter experts. These are detailed in Section 5.

2.4.3 Rational for choice of indicators

Following engagement with various DMAs and as required by the ESD, ecological and social environmental values have been identified for protection within the Development Envelope. To support these values three environmental outcomes have been defined for this VMP (Section 2.4.1).

For each relevant environmental outcome, a set of indicators have been established to provide the environmental quality benchmarks against which environmental quality and the performance of environmental management can be measured. These indicators are quantitative and are described numerically. The key to

successful environmental management is to maintain environmental quality within the bounds described by the indicators, thereby achieving the environmental quality outcomes and ensuring the environmental values continue to be supported.

Indicators have been selected through reviewing a range of industry standards, guidelines and scientific papers. Although these are detailed in the relevant programs, a summary of the documentation that BNR used to identify indicators for the various programs is detailed in Table 2-7.

Table 2-7: Indicator rationale

Program	Reference	Summary
Soil Quality	NEPC (1999). Assessment of Site Contamination Measure (NEPM), Schedule B (1) – Guideline on the Investigation Levels for Soil and Groundwater (NEPC 1999)	Provides: • a comprehensive list of analytes that BNR plans to sample at each well site • ecological screening levels and ecological investigation levels are presented for some of the constituents.
	Botta, C (2015). Understanding your soil test - Step by Step. Yea River Catchment Landcare Group (Botta 2015)	Provides: • information to assist land managers in understanding and interpreting soil test data • chloride critical levels for different types of soil where plant damage can occur.
	DEC (2010). Assessment levels for Soil, Sediment and Water. Contaminated Sites Management Series. Department of Environment and Conservation (DEC 2010)	Provides: • a comprehensive list of analytes that BNR plans to sample at each well site • ecological screening levels and ecological investigation levels are presented for some of the constituents • the source of these screening and investigation levels.
Air Quality	NEPC (2016). National Environment Protection (Ambient Air Quality) Measure. National Environment Protection Council (NEPC 2016)	Provides: • a list of air pollutants that BNR plans to sample for the Proposal • maximum concentration standards are presented for some of the air pollutants BNR plans to sample.
	NEPC (2004). National Environment Protection (Air Toxics) Measure. National Environment Protection Council (NEPC 2004)	Provides: • a list of air pollutants that BNR plans to sample for the Proposal • monitoring investigation levels are presented for some of the air pollutants BNR plans to sample.
	DWER (2019). Air emissions - draft guideline. Department of Water and Environmental Regulation (DWER 2019)	Provides: • a comprehensive list of substances and associated air quality guideline values (maximum ambient concentrations) • the maximum ambient concentrations for an air pollutant planned to be sampled by BNR.
	EPA NSW (2016). Approved methods for the modelling and assessment of air pollutants in New South Wales. Sydney: Department of Environment and Conservation (EPA NSW 2016)	Provides: • a comprehensive list of individual toxic air pollutants • the pollutants' impact assessment criteria, used as guideline values in other referenced sources in the VMP.
	WHO (2010). WHO guidelines for indoor air quality: selected pollutants. World Health Organization (WHO 2010)	Provides: • indoor air quality guideline values for selected pollutants, which have been used by BNR where health or environmental values were available.

Methane Emissions	Monitoring program laboratory reports	Provide: • laboratory limits of reporting, which have been used by BNR as indicators for trigger and threshold monitoring criteria, where no guideline values were available.
NORM	NCRP (1999). Report No. 129: Recommended screening limits for contaminated surface soil and review of factors relevant to site-specific studies. National Council on Radiation Protection and Measurements (NCRP 1999)	Provides: • a list of radionuclides which can be encountered in contaminated surface soils • screening limits (screening reference levels) for contaminated surface soils.
	APPEA. 2002. Guidelines for Naturally Occurring Radioactive Materials. Australian Petroleum Production & Exploration Association Limited (APPEA 2002)	Provides: • monitoring and management guidance of occupational radiation exposures • A radium trigger level for material.

3 VMP components

3.1 Soil quality

The EPA objective for Terrestrial Quality is:

- to maintain the quality of land and soils so that environmental values are protected.

BNR does not believe that the Proposal activities will result in any significant impacts to soil quality. Subsequently, the soil quality monitoring program has been developed to meet the following objective:

- no short or long-term adverse impacts to soil quality.

To understand if the Proposal and associated emissions have had any short or long-term adverse impacts to soil quality, BNR collected initial soil samples prior to submitting the draft ERD and followed up with the collection of localized samples in August 2023.

In addition, BNR will collect soil samples and analyse local soil quality at all well sites associated with the Proposal located within the Development Envelope and compare these to the earlier soil collections to finalise a pre-impact baseline. Pre-impact and post activity sampling can then be used to demonstrate upon completion of the activities that no contamination events occurred, or that contamination events occurred, and the area was appropriately rehabilitated. In completing this monitoring program, BNR can verify if the Proposal was undertaken in a manner that maintained the quality of land and soils such that that environmental and social values were protected.

3.1.1 Sample location and frequency

The proposed soil quality monitoring program (including the location and frequency) is detailed in Table 3-1.

Table 3-1: Soil quality monitoring location and frequency

Monitoring type	Location	Phase	Frequency	Number of samples
Pre-impact (profile)	At each well site	Post vegetation clearing and prior to well site sheeting.	Once only. BNR considers that the program will provide sufficient data to complement existing data sets and detail soil profile across the Development Envelope.	One profile will be taken at each well site.
Pre-impact (quality)	At each well site	Post vegetation clearing and prior to well site sheeting.	Once only. BNR considers that the program will provide sufficient data to complement existing data sets and confirm existing soil quality. Soil quality is not affected by seasonal conditions.	At least three samples will be taken at each well site.
Activity (quality)	Flare pit Mud Sump	Prior site reinstatement.	Once only. BNR considers that one sample at these locations will provide sufficient data to confirm if soil quality is suitable to undertake site reinstatement activities.	• Three soil samples to be collected from beneath the flare pit sump tank (0 m deep). • Four samples from the surrounding internal flare pit base (<0.5 m deep). • Two samples of native soils from the flare pit base beneath the gravel ballast material (as appropriate > 0.5m deep). • Three soil samples to be collected from beneath the mud sump (0 m deep). The number of samples were based upon the size of

				infrastructure being investigated and the risk profile of the infrastructure. Where samples indicate contamination has occurred, additional sampling will be undertaken at different locations (and depths) to understand the extent of potential contamination and remediation required.
	Spill Location	Post recovery of contaminated soils	In the event of a Level 2 or 3 spill event in accordance with the OSCP (i.e. a large spill event).	Soil samples will be taken beneath the recovered contaminated soil. Where soil samples provide evidence of contamination, additional soil is to be removed/ recovered, and additional samples collected. This will be repeated until the soil samples indicate a lack of contamination

3.1.2 Sampling methodology

Soil profiles will be manually collected by auger or shovels (or equivalent) such that soil horizons can be identified. Soil samples will be manually collected by auger or shovels (or equivalent) and analysed by a laboratory using NATA accredited methods.

3.1.3 Soil quality indicators

The NEPC Assessment of Site Contamination Measure (NEPM), Schedule B (1) – Guideline on the Investigation Levels for Soil and Groundwater (1999) (NEPC 1999) presents a comprehensive list of analytes that has been used and that BNR will use in the future to sample at each well site. As detailed in the ERD, BNR has identified the following fluids as having the potential to impact soil quality:

- hydrocarbons (diesel spill event)
- drilling fluids / cement (surface spill event)
- HFS fluids (surface spill event)
- produced formation water (PFW) (spill event).

On this basis, the following analytes have been identified for the Proposal to be used as indicators of spill events:

- barium
- cadmium
- chloride
- chromium III
- Total Petroleum Hydrocarbons (TPH).

These will serve as indicators to identify if a release has occurred and trigger a more detailed analysis of all CoPCs.

The Assessment of Site Contamination Measure (NEPC 1999) provides a guideline in which ecological screening levels and ecological investigation levels are presented for some of these analytes. The ecological screening levels and ecological investigation levels will be used as the indicators for this soil monitoring program and are detailed in Table 3-2.

Table 3-2: Soil quality analytes and indicators

Analyte	Indicators
Barium	300 mg/kg (NEPC 1999)
Cadmium	3 mg/kg – Environmental (NEPC 1999)
Chloride	No environmental or health guidelines have been defined for chloride, as such the indicator has been set to the chloride critical level for sands to sandy loam where plant damage can occur: 120 mg/kg (Botta 2015)
Chromium III	400 mg/kg (NEPC 1999)
TPH (C10-C14)	500 mg/kg (DEC 2010)
TPH (C15-C18)	1000 mg/kg (DEC 2010)
TPH (C6-C9)	100 mg/kg (DEC 2010)

Table 3-3: VMP components – soil quality

EPA factor/s and objective/s	To maintain environmental quality and to minimise the risk of environmental harm, so that environmental values are protected			
Outcome/s	No short or long-term changes to soil quality			
Key environmental values	Pastoral station (existing land-use)			
Key impacts and risks	Contamination of land and soils from surface spills			
Indicators	**Response actions**	**Monitoring**	**Frequency**	**Reporting**
Trigger criteria Impact vs control analysis [1] indicates no significant deviation from baseline soil quality samples	**Trigger level actions** Within 60 days of exceedance: • identify the reason for the exceedance and determine direct correlation to construction / ongoing activities or natural variation and review management measures with an adaptive management response • re-examine monitoring results (QA/QC) to validate data • conduct additional sampling/monitoring if required.	Refer to Table 3-1	Refer to Table 3-1	Routine reporting - annual reporting through the DEMIRS Annual Environmental Report (AER) Exceedance reporting to EPA compliance branch – exceedance of the threshold criteria and contingency actions that have been implemented – within 5 days.
Threshold criteria Exceedance of soil indicators (Table 3-2)	**Threshold contingency actions** Within 30 days of exceedance initiate implementation of contingency measures including: • re-examine monitoring results (QA / QC) to validate data. Re-monitor if required • ground truth the monitoring results to validate findings of the assessment and/or determine/identify what may be causing the exceedance. Where cause is identified during ground truthing and can be rectified, undertake action immediately. For actions which require alternate resources, schedule works to be undertaken as soon as possible • where the threshold exceedance was not caused by construction or project activities, resume standard monitoring frequency • where the threshold exceedance can be attributed to project activities: o implement adaptive management response that may then require: ▪ remediation of soil to commence as required ▪ soil to be disposed offsite ▪ conduct additional sampling / monitoring if required, until a trend back to baseline levels has been demonstrated **and** at least two consecutive results reflect no significant deviation from ambient (baseline) samples.	Refer to Table 3-1	Refer to Table 3-1	

[1] Given the limited data that is planned to be collected, BNR propose an Impact versus Control approach to assess impacts. BNR plans to collect control samples at each well site prior to construction activities commencing which will enable natural variation at each site to be understood.

3.2 Air quality

The EPA objective for Air Quality is:

- to maintain air quality and minimise emissions so that environmental values are protected.

BNR does not believe that the Proposal activities will result in any significant impacts to air quality. Subsequently, the air quality monitoring program has been developed to meet the following objective:

- no short or long-term adverse impacts to air quality.

To understand if the Proposal and associated emissions have had any short or long-term adverse impacts to air quality, BNR plans to collect air quality samples and analyse for presence of dust and volatile organic carbon (VOC). Pre-impact (baseline) and post activity sampling can then be used to demonstrate upon completion of the activities that no short or long-term impacts to air quality have occurred. In completing this monitoring program, BNR can verify if the Proposal was undertaken in a manner that maintained the quality of air such that that environmental and social values were protected.

3.2.1 Sampling location and frequency

The proposed air quality monitoring program (including the location and frequency) is detailed in Table 3-4.

Table 3-4: Air quality monitoring location and frequency

Monitoring type	Location	Phase	Frequency	Number of samples
Project activities	Downwind on the edge of the well site (or as near to the well site as is safe) At the Nidavellir and Jotunheim well sites (well sites closest to sensitive receptors)	During drilling and HFS	Continuous monitoring station instrument for particulate matter (PM) during drilling and HFS (March-November)	One monitoring station continuously recording hourly PM samples.
	On the edge of the well site (or as near to the well site as is safe) downwind from the proppant storage area, well head, and flare pit. At the Nidavellir and Jotunheim well sites (well sites closest to sensitive receptors)		24-hour VOC canister / location (monthly)	Three VOC canisters positioned in an impact gradient position to understand concentration dispersion over time.
	On the edge of the well site (or as near to the well site as is safe) downwind from the flare At the Nidavellir and Jotunheim well sites (well sites closest to sensitive receptors)		30-day dust deposition gauges (DDGs) / location (monthly)	Three DDGs.
	At existing baseline locations (named AQ_CN and AQ_CS) with a line-of-sight to two closest communities (sensitive receptors)	During drilling and HFS	• continuous monitoring station instrument for PM / location (March-November) • 24-hour VOC canister / location (monthly) • 30-day DDG / location (monthly)	• one monitoring station continuously recording hourly PM samples near each community • one DDG located at each monitoring station • one VOC canister at each monitoring location.

3.2.2 Sampling methodology

3.2.2.1 Dust

BNR plans to continue collecting dust samples using DDGs over an exposure time of 30 days, with the samples analysed by a NATA-accredited laboratory. This method measures dust deposition rate and involves the passive deposition and capture of dust within a funnel and bottle arrangement, thus determining the relative 'dustiness' of the sampling sites.

BNR will continue collecting and analysing PM_{10} and $PM_{2.5}$ using continuous light scattering instruments within air quality monitoring stations. By drawing a constant flow rate of ambient air through a filter, this method determines average dust concentrations over a 24-hour period. Coupled with wind records or collected wind data, this method enables determination of dust levels from a particular event or source. It also provides an indication of the potential health effects of the dust given it measures fine and very fine particles present in the atmosphere.

3.2.2.2 Volatile organic compounds

BNR plans to continue collecting VOCs using 24-hour canisters, in accordance with the *Compendium Method TO-15 – Determination of volatile organic compounds in air collected in specially prepared canisters and analysed by gas chromatography / mass spectrometry* (US EPA 1999), with the samples analysed by a NATA-accredited laboratory. Ambient air is admitted into the canister (under vacuum) using a calibrated passive air flow sampler, at a controlled rate over the set period of 24-hours, to obtain a time integrated, whole-air sample. Selected air toxics will then specifically be measured from the collected air in the laboratory. This method provides ambient concentrations of known pollutants present in air, thus enabling the assessment of the potential for risks to human and ecological health.

The location of VOC sampling will include the same sensitive receptor locations as the previously taken baseline samples, to provide directly comparable samples for the trigger and threshold criteria presented in Table 3-6. VOC samples will also be taken on site, with the canisters located in proximity and downwind of the project activities in a manner to understand concentration dispersion over time.

3.2.3 Air quality indicators

Consistent with advice provided throughout the ESD and ERD process, BNR has identified the following analytes to be used in the air quality monitoring program:

- PM_{10}
- $PM_{2.5}$
- total insoluble matter (ash content + combustible matter)
- benzene
- toluene
- ethylbenzene
- total xylenes (as a total of meta-, para- and ortho-xylene)
- naphthalene.

The National Environment Protection Council (NEPC)'s National Environment Protection (Ambient Air Quality) Measure (NEPM) (NEPC 2016), and the National Environment Protection (Air Toxics) Measure (NEPC 2004), provide standards (criteria) for PM_{10} and $PM_{2.5,}$ and monitoring investigation levels for VOCs, respectively. It should be noted that the monitoring investigation level values for VOCs are levels of air pollution below which lifetime exposure, or exposure for a given averaging time, does not constitute a significant health risk. If these limits are exceeded in the short-term it does not mean that adverse health effects automatically occur (NEPC 2004). The indicators for air analytes from other sources are also provided in Table 3-5.

Table 3-5: Air quality analytes and indicators

Analyte	Indicators (health / amenity)
PM_{10}	50 µg/m^3 (24-hour average) – Health (NEPC 2016)
$PM_{2.5}$	25 µg/m^3 (24-hour average) – Health (NEPC 2016)
Total insoluble matter (= ash content + combustible matter)	4 g/m^2/30 days (maximum) – Amenity (EPA NSW 2016) 2 g/m^2/30 days (above background) – Amenity (EPA NSW 2016)
Benzene	0.003 ppm (annual average) – Health (NEPC 2004)
Toluene	1 ppm (24-hour average) – Health (NEPC 2004)
Ethylbenzene	1.8 ppm (1-hour average) – Health (DWER 2019, EPA NSW 2016)
Total Xylenes (as a total of meta-, para- and ortho-Xylene)	0.25 ppm (24-hour average) – Health (NEPC 2004)
Naphthalene	Currently there is no available health guideline for naphthalene in ambient air. As such, the World Health Organization (WHO) indoor air guideline was selected as the indicator for the air quality monitoring program. 0.01 mg/m^3 (annual average) – Health (WHO 2010)

Table 3-6: VMP components – air quality

EPA factor/s and objective/s	To maintain air quality and minimise emissions so that environmental values are protected			
Outcome/s	No short or long-term changes to air quality			
Key environmental values	Aboriginal communities			
Key impacts and risks	Reduction in air quality causing impacts to sensitive social receptors			
Indicators	**Response actions**	**Monitoring**	**Frequency**	**Reporting**
Trigger criteria Impact vs control analysis [2] indicates significant deviation from ambient air quality samples.	**Trigger level actions** Within 60 days of exceedance: • identify the reason for the exceedance and determine direct correlation to drilling/HFS or natural variation and review management measures with an adaptive management response • re-examine monitoring results (QA/QC) to validate data • conduct additional sampling / monitoring if required until a trend back to baseline levels has been demonstrated and at least two consecutive results reflect no significant deviation from ambient (baseline) samples.	Refer to Table 3-4	Refer to Table 3-4	Routine reporting - annual reporting (AER)
Threshold criteria Exceedance of air quality indicators (Table 3-5)	**Threshold contingency actions** Within 30 days of exceedance initiate implementation of contingency measures including: • re-examine monitoring results (QA/QC) to validate data. Re-monitor if required until a trend has been demonstrated • ground truth the monitoring results to validate findings of the assessment and/or determine/identify what may be causing the exceedance. Where cause is identified during ground truthing and can be rectified, undertake action immediately. For actions which require alternate resources, schedule works to be undertaken as soon as possible • where the threshold exceedance was not caused by drilling/HFS, resume standard monitoring frequency • where the threshold exceedance can be attributed to the Proposal activities: o implement adaptive management response that may then require: ▪ for dust and particulate matter: ➢ augment dust suppression through use of water cart ➢ review and adapt the storage and transportation method of proppant sand on site ▪ for VOCs:	Refer to Table 3-4	Refer to Table 3-4	Exceedance reporting to EPA compliance branch – exceedance of the threshold criteria and contingency actions that have been implemented – within 5 days.

[2] BNR proposes an Impact versus Control approach to assess impacts. BNR plans to utilise existing baseline data from across the Development Envelope on the assumption that natural variation locally is likely to be limited, this approach is considered suitable.

	➢ increase the distance between the sampling locations and re-characterise the extent of exposure from the activities ➢ consider communicating exclusion zones around the well site to prevent exposure ▪ conduct additional sampling/monitoring if required until a trend back to baseline levels has been demonstrated and at least two consecutive results reflect no significant deviation from ambient (baseline) samples .			

3.3 Methane emissions

The EPA objective for GHG Emissions is:

- To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.

BNR does not believe that the Proposal activities will result in a significant contribution to GHG emissions that will lead to environmental harm. Subsequently, the methane emissions monitoring program has been developed to meet the following objective:

- Verity that the Proposal and associated emissions have not had any short or long-term adverse impacts to air quality.

To understand if the Proposal and associated emissions have had any short of long-term adverse impacts to air quality, BNR plans to collect air quality samples and analyse for presence of methane. Pre-impact and post activity sampling can then be used to demonstrate upon completion of the activities that no short or long-term impacts to air quality have occurred. In completing this monitoring program, BNR can verify if the Proposal was undertaken in such a manner that reduced methane emissions in order to minimise the risk of environmental harm associated with climate change.

3.3.1 Sampling location and frequency

The proposed methane emissions monitoring program (including the location and frequency) is detailed in Table 3-7.

Table 3-7: Methane emissions monitoring location and frequency

Monitoring type	Location	Phase	Frequency	Number of samples
Surveillance	At each well site	Post HFS	Biennial sampling using 24-hour air canisters. BNR considers that the program will provide sufficient data to determine if any fugitive emissions from the well occur over the life of the well	One canister positioned around the well head

3.3.2 Sampling methodology

BNR plans to continue sampling for methane using 24-hour canisters, using the EP104 light hydrocarbon (calculated concentration) method, with the samples analysed by a NATA-accredited laboratory. Ambient air is admitted into the canister (under vacuum) using a calibrated passive air flow sampler, at a controlled rate over the set period of 24-hours, to obtain a time integrated, whole-air sample. Methane will then specifically be measured from the collected air in the laboratory. This method provides ambient concentrations of known pollutants present in air, thus enabling the assessment of the contribution to air pollution.

The location of methane emission monitoring will be based upon the location of the potential fugitive methane emissions arising post-activity from the Proposal.

3.3.3 Methane indicator

Given baseline samples within the Development Envelope determined that methane levels are below the detection limit (i.e. the laboratory LOR) of 3.3 mg/m^3, and given there is no environmental or health guideline value associated with methane levels, BNR has chosen to set the indicator as 3.3 mg/m^3 (Table 3-8).

Table 3-8: Methane analyte and indicator

Analyte	Indicator
Methane	3.3 mg/m^3 (laboratory LOR)

Table 3-9: VMP components – methane emissions

EPA factor/s and objective/s	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change			
Outcome/s	No short or long-term changes to air quality			
Key environmental values	Various			
Key impacts and risks	Contribution to GHG emissions.			
Indicators	**Response actions**	**Monitoring**	**Frequency**	**Reporting**
Trigger criteria A single exceedance of the indicator (Table 3-8)	**Trigger level actions** Within 60 days of exceedance: • identify the reason for the exceedance and determine direct correlation to project activities or natural variation, and review management measures with an adaptive management response • re-examine monitoring results (QA/QC) to validate data • conduct additional sampling within 6 months if required and until a trend back to baseline levels has been demonstrated and at least two consecutive results reflect no significant deviation from ambient (baseline) samples.	Table 3-7	Table 3-7	Routine reporting - annual reporting (AER) Exceedance of the threshold criteria and contingency actions that have been implemented due to the exceedance of threshold criteria – within 5 days.
Threshold criteria Consecutive exceedance of the indicator (Table 3-8)	**Threshold contingency actions** Within 30 days of exceedance initiate implementation of contingency measures including: • identify the reason for the exceedance and determine direct correlation to well site fugitive gas emissions, existing land use, or natural variation and review management measures with an adaptive management response • re-examine monitoring results (QA/QC) to validate data. • where the exceedance was not caused by the assets, resume standard monitoring frequency • where the threshold exceedance can be attributed to the assets: o implement adaptive management response that may then require: ▪ conduct additional sampling monitoring if required, increasing the monitoring frequency if required, to determine if emissions reduce and continue monitoring until a trend back to baseline levels has been demonstrated and at least two consecutive results reflect no significant deviation from ambient (baseline) samples. ▪ investigate assets to confirm if gas leakage is occurring and determine how leakage can be remediated on the asset ▪ remediate assets to prevent further gas leakage and fugitive emissions ▪ continue sampling/monitoring post remediation.	Table 3-7	Table 3-7	

3.4 NORM

The EPA objective for Human Health is:

- to protect human health from significant harm.

BNR does not believe that the Proposal activities will result in any impacts to human health. Subsequently, the NORM monitoring program has been developed to meet the following objective:

- no short or long-term adverse impacts to human health.

To understand if the Proposal and associated NORM emissions have had any short or long-term adverse impacts to human health, BNR plans to collect drill cuttings and PFW samples and analyse for the presence of NORM. Based upon NORM presence and levels, post activity sampling can be used to demonstrate upon completion of the activities that no short or long-term impacts to human health (limited to public health) have occurred. In completing this monitoring program, BNR can verify that the Proposal was undertaken in such a manner that protected human health from significant harm.

3.4.1 Sampling location and frequency

The proposed NORM monitoring program (including the location and frequency) is detailed in Table 3-10.

Table 3-10: NORM monitoring location and frequency

Monitoring type	Location	Phase	Frequency	Number of samples
Project activities	Mud sump	Following well drilling	Once only. BNR considers that one sample will provide sufficient data to characterise the composition of drill cuttings and confirm if NORM is present	One sample of drill cuttings within the mud sump at each well site
Project activities	Produced water retention pond	During well testing	Once only. BNR considers that one sample will provide sufficient data to characterise the composition of the formation water produced during HFS and confirm if NORM is present	One sample of PFW at each well site

3.4.2 Sampling methodology

Drill cutting samples will be manually collected using lab-supplied jars, and PFW samples collected using lab-supplied bottles, and analysed by a laboratory using NATA accredited methods.

3.4.3 NORM indicators

NORM indicators were based on the screening reference levels from the NCRP Report No. 129 Recommended screening limits for contaminated surface soil and review of factors relevant to site-specific studies (NCRP 1999). For each radionuclide, the screening reference level is the most conservative value from the range of land-use scenarios presented in the NCRP report. The screening levels are designed to restrict the total annual dose to any exposed person from a single contaminated site to no more than 250 µSv. The indicators for drill cutting NORM are provided in Table 3-11.

Table 3-11: NORM and indicator for drill cuttings

Analyte	Indicators (soil)
Uranium-238	620 Bq/kg (NCRP 1999)
Radium-226	3.7 Bq/kg (NCRP 1999)
Radium-228	In the absence of a specific guideline value for Radium-228 in soil, BNR have used the general radium guideline limit for solid NORM specified in the APPEA NORM guidelines (APPEA 2002):

	2,400 Bq/kg – should the specific radium activity exceed this value, the material should be regarded as NORM (APPEA 2002)
Lead-210	14 Bq/kg (NCRP 1999)
Thorium-232	2.3 Bq/kg (NCRP 1999)

Produced formation water NORM indicators were based on the Australian Drinking Water Guidelines (NHMRC and NRMMC 2011 (updated March 2021)), which provide a guideline value for annual exposure to radioactivity in drinking water. Produced formation water NORM indicators are presented in Table 3-12 below.

Table 3-12: NORM Indicators for PFW

Analyte	Indicators
Uranium isotopes (Uranium-238)	0.17 mg/L – Non-potable groundwater use (DOH 2014) The Australian water quality guidance level in drinking water is 0.5 Bq/L for gross alpha (α) and 0.5 Bq/L for gross beta (β). 0.5 Bq/L (NHMRC and NRMMC 2011)
Radium isotopes (Radium-226, Radium-228) Lead isotopes (Lead-210) Thorium isotopes (Thorium-232)	The Australian water quality guidance level in drinking water is 0.5 Bq/L for gross alpha (α) and 0.5 Bq/L for gross beta (β). 0.5 Bq/L (NHMRC and NRMMC 2011)

Table 3-13: VMP components – human health

EPA factor/s and objective/s	To protect human health from significant harm			
Outcome/s	No short or long-term adverse impacts to human health			
Key environmental values	Human Health			
Key impacts and risks	Build-up and release of radioactive substances or emissions that may impact on human health			
Indicators	**Response actions**	**Monitoring**	**Frequency**	**Reporting**
Trigger criteria Exceedance of NORM indicators (Table 3-11 and Table 3-12).	**Trigger level actions** • Within 60 days of exceedance: o re-examine monitoring results (QA/QC) to validate data o conduct additional sampling/monitoring if required to determine if NORM levels have changed o adapt the waste management strategy (including storage and disposal of wastes) for drill cuttings and PFW.	Table 3-10	Table 3-10	Annual reporting (AER) Exceedance reporting to EPA compliance branch – exceedance of the threshold criteria and contingency actions that have been implemented – within 5 days.

4 Adaptive management and review of the VMP

4.1 Adaptive management

This VMP is intended to be dynamic and may be updated to reflect changes in management practices and the natural environment over time. Consequently, BNR will implement an adaptive management framework that allows BNR to adapt and implement improvements as a result of monitoring against trigger and threshold criteria detailed in this document. This will ensure that impacts and risks are reduced to as low as reasonably practicable as well as ensuring the environmental outcomes of this VMP are achieved.

The following approaches will apply:

- monitoring data will be systematically evaluated
- the effectiveness and relevance of trigger level and threshold contingency actions will be evaluated to determine if any changes to response actions are required.

Adaptive management practices that will be assessed as part of this approach may include:

- evaluation of each monitoring program, data and comparison to baseline data and reference sites on an annual basis to verify whether responses to Proposal activities are the same or similar to predictions
- evaluation of assumptions and uncertainties of the management and monitoring program
- re-evaluation of the risk assessment and revision of risk-based priorities as a result of monitoring outcomes
- review of data and information gathered over the review period that has increased understanding of site environment in the context of the regional ecosystem
- assessment of changes which are outside the control of the project and the response actions identified.

4.2 Monitoring plan review

In the event this plan is reviewed over the duration of the Proposal, BNR will treat it the same as other Part IV Environmental Management Plans. Specifically, a table summarising the changes following the template provided as Table 4-1 will be developed. This table will clearly indicate location and reason/s for changes. A tracked change version of the revised VMP will be provided for all minor, non-structural changes to the document.

Table 4-1: VMP review template

Complexity of changes	Minor revisions ☐	Moderate revisions ☐	Major revisions ☐	
Number of key environmental factors	One ☐	2-3 ☐	> 3 ☐	
Date revision submitted to EPA	DD/MM/YYYY			
Proponent's operational requirement timeframe for approval of revision	< One Month ☐	< Six Months ☐	> Six Months ☐	None ☐
Reason for Timeframe				

Item number	VMP section number	VMP page number	Summary of change	Reason for change
1.				
2.				
3.				

5 Stakeholder consultation

BNR consulted with stakeholders during the development of the EPA referral. Engagements that are deemed relevant are included in Table 5-1.

Table 5-1:Stakeholder engagement relevant to this VMP

Stakeholder	Method of engagement	Date of engagement	Summary of engagement
Department of Planning, Lands and Heritage (DPLH)	Email	18 Jun 2021	Received approval from DPLH for the temporary installation of an air quality monitoring station within an Aboriginal heritage site.
YAC	Email	14 Jun 2021	BNR requested approval to install air quality monitoring stations within the Noonkanbah Station as part of the Valhalla baseline air quality and GHG monitoring program. Approval granted.
Blina Station manager	Phone and email	14 Jun 2021	BNR provided locations of proposed air quality monitoring stations for the air quality and GHG monitoring program, prior to site installation that month.
EPA	Phone	04 Jun 2021	Discussed baseline monitoring requirements from the draft ESD and requested to remove the requirement to sample at each well site for a period of 24 months, and change to sampling representative control sites for a period of 24 months.
Blina Station manager	Phone and email	19 May 2021	BNR discussed the installation of air quality monitoring stations on Blina Station as part of the air quality and GHG baseline monitoring program. Station manager approved the installation of the equipment on Blina Station and suggested providing help to install these.
EPA	Email	15 Feb 2021	Discussed monitoring frameworks for dust, VOCs, and GHG monitoring. EPA enquired about the justification for the monitoring locations.
EPA	Meeting	08 Feb 2021	Discussed next steps with the EPA and to confirm the baseline monitoring frameworks. BNR action included sending the monitoring frameworks to the EPA with the aim of individually engaging with the relevant EPA branches to confirm each monitoring approach.
EPA	Phone	02 Feb 2021	Discussed baseline air quality monitoring. EPA waiting on suitable branch / personnel to review GHG baseline and confirmation of the objectives of air quality studies that have not progressed. Level of assessment likely released over the next week.

For a full summary of stakeholder engagement records refer to the BNR Environmental Review Document (BNR_HSE_MP_013).

Any additional consultation specifically regarding this VMP will be captured in subsequent revisions.

6 References

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DWER. 2019. *Air emissions - draft guideline.* Department of Water and Environmental Regulation.

EPA. 2021. *Environmental Factor Guideline. Air Quality. EPA.* Western Australia: Environmental Protection Authority.

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EPA NSW. 2016. *Approved methods for the modelling and assessment of air pollutants in New South Wales.* Sydney: Department of Environment and Conservation.

NCRP. 1999. *Report No. 129: Recommended screening limits for contaminated surface soil and review of factors relevant to site-specific studies .* National Council on Radiation Protection and Measurements.

NEPC. 1999. *Assessment of Site Contamination Measure (NEPM), Schedule B (1) – Guideline on the Investigation Levels for Soil and Groundwater.* National Environment Protection Council .

NEPC. 2004. *National Environment Protection (Air Toxics) Measure.* National Environment Protection Council.

NEPC. 2016. *National Environment Protection (Ambient Air Quality) Measure.* National Environment Protection Council.

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US EPA. 1999. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Compendium Method TO-15.* EPA/625/R-96/010b, Cincinnati, U.S.: Center for Environmental Research Information, Office of Research and Development.

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Appendix F. Regional Baseline Soil Sampling Report

VALHALLA GAS EXPLORATION AND APPRAISAL PROGRAM – SOIL QUALITY MONITORING REPORT

Client	Bennett Resources Pty Ltd
Document number	AES-BNR-REP-05
Revision	1
Revision date	10 Jan 2022

Document history

Revision	Date	Description	Author	Reviewer	Approver
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1	10 Jan 2022	For EPA submission	AdV	SR	SR

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Acronyms and Abbreviations

Term	Abbreviation
AES	Australasian Environmental Solutions
BNR	Bennett Resources Pty Ltd
CoPC	Constituents of Potential Concern
DEC	Department of Energy and Conservation
DER	Department of Environment Regulation
DoH	Department of Health
EC	Electrical Conductivity
NATA	National Association of Testing Authorities
OM	Organic Matter
Proposal	Valhalla Gas Exploration and Appraisal Program
PSD	Particle Size Distribution
RSL	Regional Screening Level
TOC	Total Organic Carbon
VOC	Volatile Organic Compounds
WA	Western Australia

Units

Term	Definition
%	percentage
%w/w	Weight concentration – weight per weight
µm	micrometre
µS/cm	Microseimens per centimetre
cm	centimetre
kg	kilogram
km^2	Square kilometre
m	metre
mg/kg	milligram/kilogram
mL	millilitre
mm	millimetre
pH	Potential of Hydrogen, the pH unit

1 INTRODUCTION

Australasian Environmental Solutions Pty Ltd (AES) was contracted by Bennett Resources Pty Ltd (BNR) to undertake a baseline soil quality sampling within the Valhalla Gas Exploration and Appraisal Program's (the Proposal) Development Envelope, in accordance with the SQ1 Baseline Soil Quality Sampling Framework (no doc ID). The SQ1 framework involves the one-time sampling of sites, located in proximity to the proposed well site locations put forward in the Valhalla Proposal, to gather regional baseline soil quality data.

Baseline soil sampling was undertaken on 19 August 2021, with samples submitted to the laboratory on 25 August 2021 for analysis. Soil samples were collected from a total of six representative baseline sites located in the Exploration Permit EP 371, in the Canning Basin, Shire of Derby-West Kimberley, Western Australia (WA) (Figure 2-1). Specifically, these sites were selected for their location in different mapped soil landscape systems, and for their location in relation to the Proposal's Development Envelope and proximity to the proposed well sites.

1.1 Purpose and objectives

The purpose of this sampling report is to summarise the baseline soil sampling event, which will aid in the understanding of a local and regional soil quality assessment, as well as supporting the development of any future soil sampling and monitoring events that may occur throughout the duration of the Proposal.

The objectives of the report are to:

- Outline the sampling event
- Summarise the methodology
- Present any sampling event limitations
- Present the laboratory results
- Interpret and conclude on the baseline results.

1.2 Scope of work

The following activities were carried out as part of the scope of work for the baseline soil sampling event:

In six chosen sites:

- Measure out one 10m x 10m quadrat at each of the chosen soil locations
- Select five random locations within each quadrat, to yield one combined representative site sample
- Collect soil samples
- Submit samples to a NATA-accredited laboratory for the analysis of a comprehensive list of analytes and physical properties, and
- Prepare this report to inform on the methodology, field activities, limitations, results, interpretation and conclusions.

The results provided in this report are presented against the laboratory's limits of reporting or detection, which do not provide a comparison in terms of soil quality. A comparison against ecological and health screening levels has therefore been included to interpret the broad soil quality of the soil landscape systems sampled in the Development Envelope. Additional comparison against broader soil quality criteria is also within scope of this report.

2 SITE IDENTIFICATION

The indicative sites were firstly identified following a desktop assessment and scouting trip, undertaken in July 2021 to ascertain access to the chosen sites.

The sampling event was undertaken to assess baseline soil quality, therefore sites (Figure 2-1) were selected based upon mapped soil landscape systems within the Development Envelope, away from currently known or historically disturbed areas, such as near petroleum well sites, gravel pits and pastoral zones of influence (highly disturbed areas from cattle aggregation). The sites were selected as close as possible to certain proposed well site locations, in three different soil landscape systems (an additional system was sampled near the Mount Hardman creek given the proximity of this soil landscape system to some proposed well sites). Further detail on the sampling site justification is presented in the SQ1 Baseline Soil Quality Sampling Framework (no doc ID).

The soil sampling sites are presented in Table 4-1.

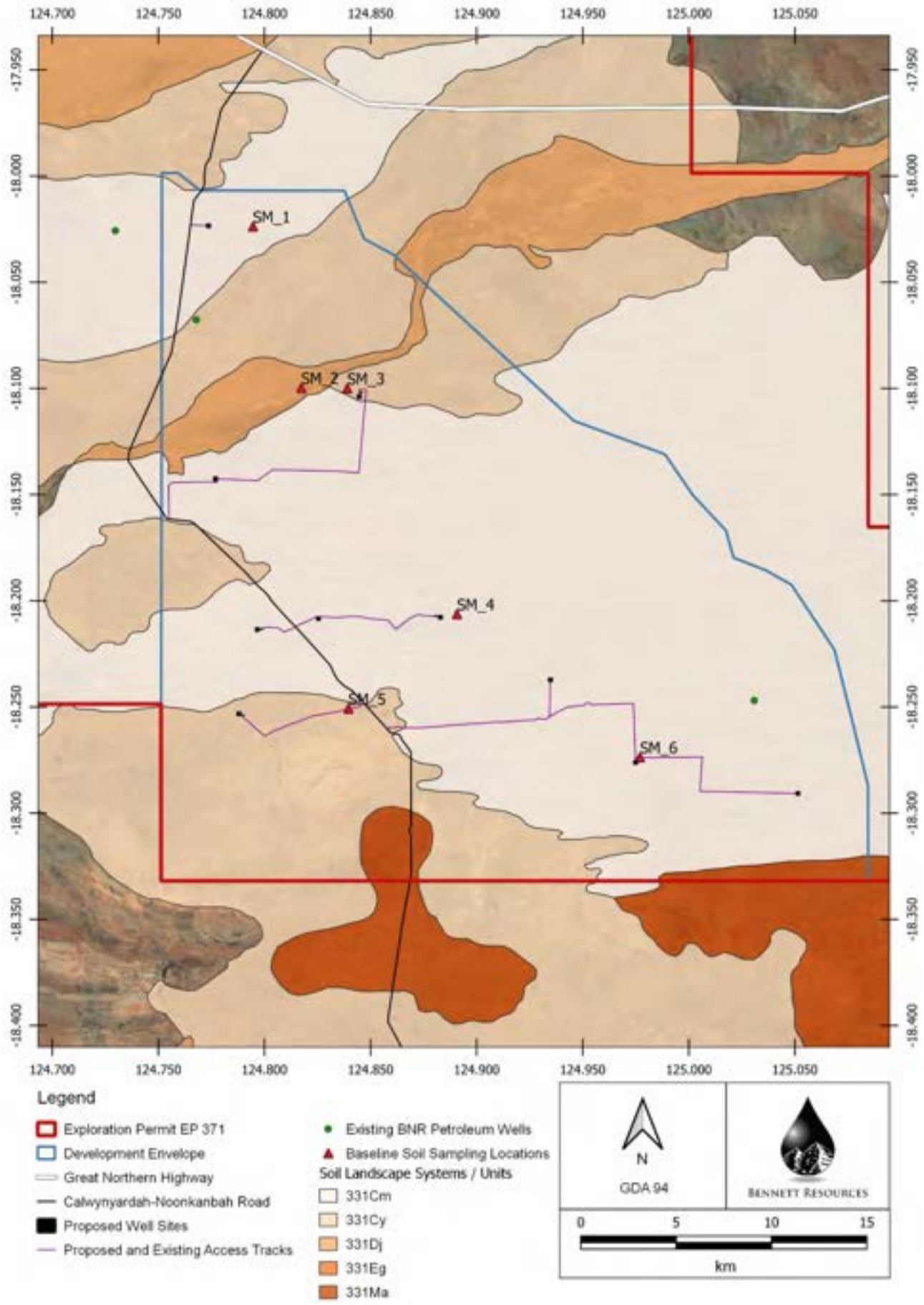

Figure 2-1: Baseline soil sampling sites

3 SUMMARY OF RECEIVING ENVIRONMENT

The Development Envelope is located within the 331 – North Fitzroy Plain Zone (soil landscape land quality zone), that covers an area of 17,925 km^2 (Tille 2006). The North Fitzroy Plain Zone is comprised of floodplains and sandplains (with alluvial plains and undulating plains) on Permian sedimentary rocks of the Canning Basin with self-mulching cracking clays, Red deep sands, Red sandy earths and Red / brown non-cracking clays. Rangeland Land Systems mapping, prepared by DPIRD, describe the biophysical characteristics of each region and separates these into land systems, which are defined as repeating patterns of topography, soil and vegetation. The Development Envelope covers four soil landscape systems (as seen in Figure 2-1), which are described as (Government of Western Australia 2021, Payne and Schoknecht 2011):

- 331Cm: Camelgooda System: Sandplains, swales and linear sand dunes supporting low pindan woodlands of acacias and low woodlands of bauhinia and bloodwood with curly spinifex and ribbon grass
- 331Cy: Calwynyardah System: Alluvial plains with scalded tracts downslope from lateritic remnants with yellowish loamy soils supporting patchy beefwood-bauhinia low woodlands with curly spinifex and ribbon grass; also minor hard spinifex grasslands
- 331Dj: Djada System: Active flood-plains with levees and levee back slopes supporting ghost gum open woodlands with frontage grasses, and cracking clay back plains supporting ribbon grass-blue grass and Mitchell grass grasslands
- 331Ma: Mamilu System: Plains and sandplains, deep red sands and yellowish loamy soils on lateritised sedimentary rocks supporting beefwood-bauhinia low woodlands and pindan acacia shrublands with curly spinifex and ribbon grass.

4 SAMPLING METHODOLOGY

Sampling was conducted as per the BNR Water and Soil Sampling Work Procedure (BNR_HSE_PR_006). The sampling methodology and analysis were reviewed using the following guideline: Department of Environmental Protection (WA): Development of Sampling and Analysis Programs (December 2001) (Department of Environmental Protection 2001).

Samples were collected by AES field staff on 19 August 2021 (Table 4-1).

Table 4-1: Valhalla baseline soil sampling sites

Site name	Soil landscape system	GPS L\location of sites (GDA 94)	Sampling date and time	Sampling depth and method
SM_1	331Cm	-18.023804 124.794597	19 Aug 2021 12:15 pm	0-40 cm mixture, soil shovel and tape measure (inappropriate soil for soil auger). 2 x 250 mL jars 1 x ~1kg soil bag
SM_2	331Dj	-18.099759 124.817378	19 Aug 2021 11:10 am	0-20 cm mixture, soil shovel and tape measure (inappropriate soil for soil auger) 2 x 250 mL jars 1 x ~1kg soil bag
SM_3	331Cy	-18.1 124.839047	19 Aug 2021 10:35 am	0-40 cm mixture, soil shovel and tape measure (inappropriate soil for soil auger) 2 x 250 mL jars 1 x ~1kg soil bag
SM_4	331Cm	-18.206345 124.890748	19 Aug 2021 09:45 am	0-40 cm mixture, soil shovel and tape measure (inappropriate soil for soil auger) 2 x 250 mL jars 1 x ~1kg soil bag
SM_5	331Cy	-18.250809 124.839569	19 Aug 2021 08:40 am	0-40 cm mixture, soil shovel and tape measure (inappropriate soil for soil auger)

				2 x 250 mL jars 1 x ~1kg soil bag
SM_6	331Cm	-18.273705 124.977	19 Aug 2021 07:30 am	0-40 cm mixture, soil shovel and tape measure (inappropriate soil for soil auger) 2 x 250 mL jars 1 x ~1kg soil bag

4.1 Sampling event limitations

As per Table 4-1, all sites were sampled. Sampling was undertaken in proximity to the indicative sites identified prior to the sampling event.

A simple soil auger was proposed to be used to sample soil to the depth of <40 cm. However, each soil site and thus landscape system was determined to be too dry, compact or difficult (e.g. loose sand or hard clay pan) to enable a reproducible, consistent and straightforward sample recovery with the auger.

As such, the auger was not used, and a small shovel was used. Sampling holes were dug to a depth of 40 cm.

The soil was too dry, compact or difficult (e.g. loose sand or hard clay pan) to obtain a suitable / consistent soil profile at each site with the equipment available. Soil depths were noted in some instances to be <5 cm prior to reaching the limit of hardpan.

All sites, with the exception of SM_2, were easily sampled given the type of soil encountered; predominantly sands and sandy soils. Samples from SM_2 were collected in the 331Dj: Djada Soil Landscape System, which consists of flood-plains with levees cracking clay back plains. This landscape system is present along the Mount Hardman Creek line and will not be encountered on the proposed well site locations for the Proposal. Samples were still collected to provide additional local background baseline data and to serve as comparison to the other soil landscape systems. Samples from SM_2 were difficult to collect with the shovel given the hard compact nature of the dry clay pan (<5 cm sample depth). Samples were required to be collected from a wider quadrat to include sandier soil near the dried creek (<20 cm sample depth), in order to submit sufficient soil matter for lab analysis.

5 CRITERIA, INVESTIGATION AND SCREENING LEVELS

Investigation and screening levels have been applied to constituents of potential concern (CoPC) to evaluate potential risks to ecosystems and human health from CoPC. Exceedance of the investigation and screening levels as presented within the adopted criteria does not necessarily infer that the substance presents a hazard or risk to human health, the environment or environmental values but that further investigation, assessment and / or risk mitigation measures are required.

5.1 References for investigation and screening levels

The following documents and guidelines addressing soil ecological and health criteria and screening levels were reviewed and applied for the interpretation of the soil sample results:

- Department of Environment and Conservation (DEC) (2010). Assessment levels for Soil, Sediment and Water. Contaminated Sites Management Series, Version 4 Revision 1, February 2010. Government of Western Australia (DEC 2010)
- Department of Environment Regulation (DER) (2014). Assessment and management of contaminated sites – Contaminated sites guidelines. December 2014. Government of Western Australia (DER 2014)
- National Environment Protection Council (NEPC) (1999). Assessment of Site Contamination) Measure (NEPM), Schedule B (1) – Guideline on the Investigation Levels for Soil and Groundwater (NEPC 1999)
- Dutch B (Indicative value for further investigation) from Moen, J.E.T., Cornet, J.P and Evers, C.W.A (1986). Soil protection and remedial actions: criteria for decision-making and standardisation of requirements, in Assink, J.W and van den Brink, W.M (1986). Contaminated Soils, First International TNO Conference on Contaminated Soil, 11-15 November 1985 (Assink and van den Brink 1986)
- ANZECC B (Environmental Investigation Levels) from ANZECC & NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC and NHMRC 1992)

- US EPA regional screening levels (RSLs) from US EPA (2009). Regional Screening Levels, available from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (US EPA 2021)
- Department of Health's (DOH) letter to DEC, dated 21 April 2009 (reference 04- 06372). Contaminated Sites Management Series of Guidelines – Assessment Levels for Soils, Sediment and Water (Version 4.0) (DoH 2009).

The following definitions (NEPC 1999) have been provided to support the basis of comparison with accepted levels:

- "Ecological investigation levels have been developed for selected metals and organic substances and are applicable for assessing risk to terrestrial ecosystems. [These] depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2 m of soil"
- "Ecological screening levels have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon (TPH) fractions and are applicable for assessing risk to terrestrial ecosystems. [These] broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top 2 m of soil"
- "Health investigation levels have been developed for a broad range of metals and organic substances. [These] are applicable for assessing human health risk via all relevant pathways of exposure. [These] are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use"
- "Health screening levels have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. [These] depend on specific soil physicochemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 m".

5.2 References for soil criteria and ratings

5.2.1 pH

As with many measurements on soils and sediments, pH values will vary depending on the procedure / laboratory analytical method used. pH ratings for pH extracted using deionised water ($pH_H{}^2{}_O$) at a sample solution ration of 1:5 are presented below in Table 5-1.

Table 5-1: Soil $pH_H{}^2{}_O$ ratings (Rayment and Lyons 2011) adapted from (Bruce and Rayment 2004) and (USDA-NRCS 2004)

$pH_H{}^2{}_O$ range	Rating (pH units)
1.8 – 3.4	Ultra acidic
3.5 – 4.4	Extremely acidic
4.5 – 5.0	Very strongly acidic
5.1 – 5.5	Strongly acidic
5.6 – 6.0	Moderately acidic
6.1 – 6.5	Slightly acidic
6.6 – 7.3	Circum-neutral
7.4 – 7.8	Slightly alkaline
7.9 – 8.4	Moderately alkaline
8.5 – 9.0	Strongly alkaline
9.1 – 10	Very strongly alkaline
>10	Ultra alkaline

5.2.2 Electrical conductivity

Electrical conductivity (EC) is typically measured in a 1:5 soil:water extract (EC (1:5)). Soil type must be considered when assessing soil salinity based on EC (1:5). Soil salinity ratings (based on standard CSIRO categories (Rayment and Lyons 2011) for sand, loam and clay types are presented in Table 5-2.

Table 5-2: Soil salinity rating for EC (1:5)

Salinity rating	Salinity rating based on EC (1:5) (µS/cm)

	Sand	Sandy loam	Loam	Clay loam	Light / medium clay	Heavy clay
Non-saline / very low	<130	<170	<200	<220	<250	<330
Slightly saline	130 – 260	170 – 330	200 – 400	220 – 440	250 – 500	330 – 670
Moderately saline	260 – 520	330 – 670	400 – 800	440 – 890	500 – 1,000	670 – 1,330
Very saline	520 – 1,060	670 – 1,330	800 – 1,600	890 – 1,780	1,000 – 2,000	1,330 – 2,670
Extremely saline	>1,060	>1,330	>1,600	>1,780	>2,000	>2,670

5.2.3 Organic carbon and organic matter

The general ranking of soil organic matter levels (Emerson 1991, Hazelton and Murphy 2016, Charman and Roper 2007), presented in Table 5-3 below, has been based on soils that are light-textured (sand loams, loams) and weakly structured. These soils broadly coincide with hard-setting soils.

Table 5-3: Relationship of soil organic matter to soil physical properties

Level of organic matter (%w/w)	Level of organic carbon (%w/w)	Rating	Interpretation
<0.70	<0.40	Extremely low	Subsoils or severely eroded, degraded surface soils
0.70 – 1.00	0.40 – 0.60	Very low	Very poor structural condition, very low structural stability
1.00 – 1.70	0.60 – 1.00	Low	Poor to moderate structural condition, low to moderate structural stability
1.70 – 3.00	1.00 – 1.80	Moderate	Average structural condition, average structural stability
3.00 – 5.15	1.80 – 3.00	High	Good structural condition, high structural stability
>5.15	>3.00	Very high	Good structural condition, high structural stability and soils probably water repellent

5.2.4 Major nutrients

In literature, major nutrients in WA soils are often analysed using the Mehlich 3 extraction multi-element soil test methodology to assess soils for potential nutrient deficiencies, toxicity or imbalance that may affect revegetation outcomes. However, the methodology employed by the NATA-accredited laboratory (acid extractable metals, AN-045) during this baseline soil analysis differs significantly from the Melhich 3 extraction methodology, thus comparison against other WA soil nutrient values was deemed not possible.

5.2.5 Laboratory analysed parameters

The analysis undertaken by the NATA-accredited laboratory SGS Perth is presented in the laboratory certificate of analysis in Appendix A. The results are also presented in Table 7-1 of Section 7.1, with comparison against ecological and health investigation and screening levels.

6 RESULTS AND DISCUSSION

6.1 Field observations

The weather condition on the day of sampling was sunny and hot (24-35° Celsius), with no cloud cover and a light predominantly south easterly wind. As the sampling was undertaken during the dry season of the Kimberley, the soil appeared very dry and in certain areas extremely hard and compact (dry clay pan).

The quadrat at each sampling site was set up away from the vehicle, with the engine switched off during sampling to avoid any potential contamination from exhaust fumes.

In-field description of the samples are presented in Table 6-1.

Table 6-1: Site descriptions

Site name	Soil landscape system (refer to Section 3)	Brief field description of the sites
SM_1	331Cm	On the top of a dune. Evidence of recent burning (timeframe unknown).
SM_2	331Dj	In dry clay pan and along creek line.
SM_3	331Cy	Evidence of cattle access. Evidence of recent burning (timeframe unknown).

SM_4	331Cm	Within grasses.
SM_5	331Cy	Within spinifex bushes. Evidence of cattle presence within the quadrat.

SM_6	331Cm	Within tall grasses.

7 RESULTS AND INTERPRETATION

Soil quality has been compared against the ecological and health levels discussed in Section 5. An interpretation of the soil chemistry is further presented in Section 7.1, following a comparison against broad soil quality ratings from literature.

Physical analysis including particle size distribution (PSD) of the soil samples is summarised in Section 7.2.

7.1 Chemical analysis

Results show that, for all soil samples, all analytes were below any of the ecological and health investigation and screening levels (Table 7-1). Overall, samples from the same soil landscape systems (SM_1, SM_4, SM_6 in 331Cm red deep sands; and SM_3, SM_5 in 331Cy yellow sandy earth) presented some differences however were within similar ranges of results. It can be inferred that the soil quality resulting from these samples are representative of the soil landscape systems present throughout the Development Envelope.

Table 7-1: Baseline soil chemical analysis and comparison against ecological and health investigation and screening levels

Analyte[1]	Units	Laboratory Limit of Reporting	Ecological Investigation and Screening Levels for Soils (mg/kg)	Health Investigation and Screening Levels for Soils (mg/kg)	Soil Sample Name (Soil Landscape System)					
					SM_1 (331Cm)	SM_2 (331Dj)	SM_3 (331Cy)	SM_4 (331Cm)	SM_5 (331Cy)	SM_6 (331Cm)
pH	pH Units	0	-	-	6.7	7.8	7.1	6.8	6.6	6.7
Conductivity of Extract (1:5 as received)	µS/cm	1	-	-	4	29	6	5	20	3
Total Dissolved Solids (by calculation)	mg/kg	5	-	-	12	87	18	15	62	10
% Moisture	%w/w	0.5	-	-	<0.5	1.6	1.0	0.9	0.9	0.9
Aluminium, Al	mg/kg	50	-	-	990	5500	2200	1300	2000	1400
Arsenic, As	mg/kg	1	20	100	<1	4	2	1	2	1
Barium, Ba	mg/kg	0.5	300	15,000	12	52	44	21	19	13
Boron, B	mg/kg	5	-	5,000	<5	<5	<5	<5	<5	<5
Cadmium, Cd	mg/kg	0.3	3	20	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	Cr III: 400	Cr III: 120,000	8.4	18	26	13	20	14
Hexavalent Chromium, Cr6+	mg/kg	0.5	Cr VI: 1	Cr VI: 100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper, Cu	mg/kg	0.5	100	1,000	0.9	7.4	2.8	1.5	2.9	2.0
Lead, Pb	mg/kg	1	600	300	2	7	3	2	4	2
Manganese, Mn	mg/kg	1	500	1,500	47	210	150	52	160	47
Nickel, Ni	mg/kg	0.5	60	600	0.9	6.6	3.4	1.7	2.8	1.9
Selenium, Se	mg/kg	3	-	200	<3	<3	<3	<3	<3	<3
Zinc, Zn	mg/kg	2	200	7,000	<2	9	5	<2	6	<2
Silver, Ag	mg/kg	1	-	-	<1	<1	<1	<1	<1	<1

[1] Soil samples analysed at a NATA-accredited laboratory.

Analyte[1]	Units	Laboratory Limit of Reporting	Ecological Investigation and Screening Levels for Soils (mg/kg)	Health Investigation and Screening Levels for Soils (mg/kg)	Soil Sample Name (Soil Landscape System)					
					SM_1 (331Cm)	SM_2 (331Dj)	SM_3 (331Cy)	SM_4 (331Cm)	SM_5 (331Cy)	SM_6 (331Cm)
Iron, Fe	mg/kg	50	-	-	3900	13000	10000	4300	14000	6000
Strontium, Sr	mg/kg	0.5	-	-	1.3	7.4	4.2	2.9	6.2	2.3
Tin, Sn	mg/kg	3	50	47,000	<3	<3	<3	<3	<3	<3
Sodium, Na	mg/kg	10	-	-	<10	15	<10	<10	24	<10
Calcium, Ca	mg/kg	5	-	-	130	1800	250	140	250	240
Magnesium, Mg	mg/kg	10	-	-	40	820	270	120	270	73
Potassium, K	mg/kg	10	-	-	79	960	400	200	330	130
Mercury	mg/kg	0.05	1	15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Thorium, Th	mg/kg	0.5	-	-	1.0	4.7	2.7	2.3	3.4	1.9
Uranium, U	mg/kg	0.1	-	-	<0.1	0.4	0.2	0.2	0.4	0.2
Total Organic Carbon	%w/w	0.05	-	-	0.22	0.32	0.24	0.28	0.36	0.30
Organic Matter	%w/w	0.1	-	-	0.38	0.55	0.41	0.48	0.62	0.51
Bicarbonate Alkalinity as HCO3 in Soil	mg/kg	25	-	-	<25	47	<25	<25	<25	<25
Carbonate Alkalinity as CO3 in Soil	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
Hydroxide Alkalinity as OH in Soil	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
Total Alkalinity as CaCO3 in Soil	mg/kg	25	-	-	<25	38	<25	<25	<25	<25
Water Soluble Fluoride	mg/kg	0.5	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloride (water extractable 1:5)	mg/kg	5	-	-	38	11	51	26	51	64
Sulfate (1:5 water extractable), SO4	mg/kg	5	2,000	-	59	52	66	93	87	57

Analyte[1]	Units	Laboratory Limit of Reporting	Ecological Investigation and Screening Levels for Soils (mg/kg)	Health Investigation and Screening Levels for Soils (mg/kg)	Soil Sample Name (Soil Landscape System)					
					SM_1 (331Cm)	SM_2 (331Dj)	SM_3 (331Cy)	SM_4 (331Cm)	SM_5 (331Cy)	SM_6 (331Cm)
Water Soluble Nitrate Nitrogen, NO_3 as N	mg/kg	0.025	-	-	0.080	2.5	<0.025	0.096	0.096	<0.025
Water Soluble Nitrate/Nitrite Nitrogen, NOx as N	mg/kg	0.025	-	-	0.77	2.7	0.80	0.59	0.77	0.93
Water Soluble ortho Phosphorus, P	mg/kg	0.02	2,000	-	0.27	0.16	0.45	0.28	0.40	0.51
Reactive Silica, Si	mg/kg	0.05	-	-	2.0	15	4.7	2.9	3.3	3.2
Reactive Silica, SiO_2	mg/kg	0.1	-	-	4.3	33	10	6.2	7.1	6.8
Benzene (VOC)	mg/kg	0.1	1	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene (VOC)	mg/kg	0.1	3	520	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene (VOC)	mg/kg	0.1	5	230	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene (VOC)	mg/kg	0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene (VOC)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes (VOC)	mg/kg	0.3	5	600	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX (VOC)	mg/kg	0.6	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Naphthalene (VOC)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene (F0)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C9	mg/kg	20	-	-	<20	<20	<20	<20	<20	<20
TRH C6-C10	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
TRH C10-C14	mg/kg	20	-	-	<20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	-	-	<45	<45	<45	<45	<45	<45

Analyte[1]	Units	Laboratory Limit of Reporting	Ecological Investigation and Screening Levels for Soils (mg/kg)	Health Investigation and Screening Levels for Soils (mg/kg)	Soil Sample Name (Soil Landscape System)					
					SM_1 (331Cm)	SM_2 (331Dj)	SM_3 (331Cy)	SM_4 (331Cm)	SM_5 (331Cy)	SM_6 (331Cm)
TRH C29-C36	mg/kg	45	-	-	<45	<45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	-	-	<100	<100	<100	<100	<100	<100
TRH >C10-C16	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	-	-	<25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	-	-	<90	<90	<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	-	-	<120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	-	-	<110	<110	<110	<110	<110	<110
TRH >C10-C40 Total (F bands)	mg/kg	210	-	-	<210	<210	<210	<210	<210	<210
Naphthalene (PAH)	mg/kg	0.1	5	60	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene (PAH)	mg/kg	0.1	10	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene (PAH)	mg/kg	0.1	10	17,000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene (PAH)	mg/kg	0.1	10	2,300	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene (PAH)	mg/kg	0.1	10	1,700	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Analyte[1]	Units	Laboratory Limit of Reporting	Ecological Investigation and Screening Levels for Soils (mg/kg)	Health Investigation and Screening Levels for Soils (mg/kg)	Soil Sample Name (Soil Landscape System)					
					SM_1 (331Cm)	SM_2 (331Dj)	SM_3 (331Cy)	SM_4 (331Cm)	SM_5 (331Cy)	SM_6 (331Cm)
Benzo(a)anthracene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b&j)fluoranthene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene (PAH)	mg/kg	0.1	1	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene (PAH)	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0 (PAH)	TEQ (mg/kg)	0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR (PAH)	TEQ (mg/kg)	0.3	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2 (PAH)	TEQ (mg/kg)	0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total PAH (18) (PAH)	mg/kg	0.8	-	20	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Total PAH (NEPM/WHO 16) (PAH)	mg/kg	0.8	-	-	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8

Source of assessment levels	NEPM (NEPC 1999)	Dutch B (Assink and van den Brink 1986)	DoH (DoH 2009)	US EPA RSLs (US EPA 2021)	ANZECC B (ANZECC and NHMRC 1992)

7.1.1 pH

Soil pH provides a measure of the soil acidity or alkalinity. Based on Table 7-1, overall pH values for the samples ranged between circum-neutral (pH 6.6 – 7.3) for red deep sands (331Cm) and yellow sandy earths (331Cy), and slightly alkaline (pH 7.4 – 7.8) for self-mulching cracking clays (331Dj).

7.1.2 Electrical conductivity

EC measures soluble salts in soils (soil salinity), which results from and depends on natural processes of landscape evolution, hydrological processes and rainfall (Hunt and Gilkes 1992). Based on the standard CSIRO categories (Rayment and Lyons 2011) (Table 5-2), soils with EC values generally below 130 µS/cm are considered non-saline.

Soils sampled within the Development Envelope recorded low EC values that ranged from 4 µS/cm to 29 µS/cm. All samples were therefore classed as non-saline. Deep red sands (331Cm) were found to least saline than yellow sandy earths (331Cy), with the self-mulching cracking clays having the highest non-saline rating of 29 µS/cm.

7.1.3 Organic carbon and organic matter

The organic matter content of soil, directly derived from plants and animals, is an important factor influencing many physical, chemical and biological soil characteristics. The presence of organic matter may increase water retention capacity, buffer pH and improved general soil structure. It is typically determined as a measure of the Total Organic Carbon (TOC) percentage.

By international standards, WA soils contain low concentrations of organic carbon. Organic carbon content is dependent upon soil texture and climate, with sandy soils and soils from tropical northern WA and arid central WA containing lower carbon contents (typically <1 %w/w in topsoil) compared to clay and loam soils from the temperate southwest regions of WA (MBS Environmental 2016). It is expected that organic carbon decreases with depth. Samples taken as part of this baseline soil sampling event combined all horizons (soil layers) up to <40 cm depth given specific soil profile analysis was out of scope. Thus, the distinction of organic carbon decrease with depth was not determined for this study.

In accordance with Table 5-3, all soils (mixtures of surface and subsoil) sampled within the Development Envelope recorded low levels of organic matter (OM) and TOC, with TOC ranging between 0.38 %w/w – 0.62 %w/w, and OM ranging between 0.22 %w/w – 0.36 %w/w. In general, deep red sands recorded less OM and TOC.

Interpretation of the values recorded for the sampling event and having regard for the relationship between OM and TOC suggest that the samples correspond to ‘low subsoils or severely eroded, degraded surface soils’. However, these interpretations are for reference only. Given that the baseline samples were selected within the wider untouched, natural environment, these are representative of the soil landscape systems. It is expected that other sands and earths in the region in the same vegetation systems will also record very low levels of OM and TOC.

7.1.4 Metals and major nutrients

As stated in Section 5.2.4, comparison of the soil results against other WA sites and their major nutrient values could not be undertaken due to the differences in lab methodologies at the time of sample analysis.

As anticipated, discrepancies were noted between the types of soil landscape systems. Metals (particularly chromium, manganese, iron) and minerals (calcium, magnesium, potassium) were generally lower in samples from the 331Cm red deep sands than in the 331Cy yellow sandy earths. Metals and silica in the comparative sample from the 331Dj self-mulching cracking clay (creekline soil sample) were in most cases significantly higher. The discrepancies in geochemistry are characteristic of these different types of soils.

7.1.5 Hydrocarbons

BTEX and hydrocarbon results were all below the laboratory’s limit of reporting.

7.2 Physical analysis

Soil particles will vary from fine clay to rocks, conventionally classed between coarse fragments (>2 mm) and fine earth (<2 mm). Sand and clay particles dominate in most WA soils and particularly within the Development Envelope.

Limited PSD data was available for these samples as particle sizing of soils <75 µm by hydrometer was not conducted where insufficient sample passed the 75 µm fraction. Only the sample SM_2 corresponding to self-mulching cracking clay soil could be sized through hydrometry <75 µm, confirming that the other samples comprise larger particles characteristic of sandy soils.

All laboratory quality control testing (including spikes and duplicates) were within acceptable ranges (Appendix A).

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Appendix A – Laboratory results

SGS

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	[redacted]	Manager	Kieran Hopkins
Client	BENNETT RESOURCES PTY LTD	Laboratory	SGS Perth Environmental
Address	LEVEL 9 EXCHANGE TOWER 40 THE ESPLANADE PERTH WA 6000	Address	28 Reid Rd Perth Airport WA 6105
Telephone	[redacted]	Telephone	(08) 9373 3500
Facsimile	(Not specified)	Facsimile	(08) 9373 3556
Email	[redacted]	Email	au.environmental.perth@sgs.com
Project	**Valhalla Program Soil Monitoring SM1**	SGS Reference	**PE154290 R0**
Order Number	**0064**	Date Received	25 Aug 2021
Samples	6	Date Reported	16 Sep 2021

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(808/20210).

Organics subcontracted to SGS Sydney, Unit 16 33 Maddox St Alexandria NSW 2015, NATA Accreditation Number: 2562, Site Number: 4354, SE222980.

Total Recoverable Metals: Al, Fe, Mn and Ca: Matrix spike recovery and MSD RPD failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
U, Th subcontracted to SGS Perth Minerals, 28 Reid Rd Perth Airport WA, WM209270

PSD subcontracted to SGS Cairns, 2/58 Comport St, Portsmith QLD 4870, NATA Accreditation Number: 2562, Site Number: 3146, CE154522.
Particle sizing of soils <75um by hydrometer not conducted where insufficent sample passes the 75um fraction.

SIGNATORIES

Hue Thanh LY
Metals Team Leader

Louise HOPE
Laboratory Technician

Mary Ann OLA-A
Inorganics Team Leader

Murray O'NEILL
Lab Technician-Nutrients Signatory

Tommy CHENG
ICP Chemist

SGS

ANALYTICAL REPORT PE154290 R0

Parameter	Units	LOR	Sample Number: PE154290.001 Sample Matrix: Soil Sample Date: 19/8/21 12:15 Sample Name: SM_1	PE154290.002 Soil 19/8/21 11:10 SM_2	PE154290.003 Soil 19/8/21 10:35 SM_3	PE154290.004 Soil 19/8/21 9:45 SM_4
pH in soil (1:5) Method: AN101 Tested: 27/8/2021						
pH	pH Units	-	6.7	7.8	7.1	6.8
Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 27/8/2021						
Conductivity of Extract (1:5 as received)	µS/cm	1	4	29	6	5
Total Dissolved Solids (by calculation)	mg/kg	5	12	87	18	15
Moisture Content Method: AN002 Tested: 27/8/2021						
% Moisture	%w/w	0.5	<0.5	1.8	1.0	0.9
Total Recoverable Elements in Soil by ICPOES Method: AN040/AN320 Tested: 30/8/2021						
Aluminium, Al	mg/kg	50	990	5500	2200	1300
Arsenic, As	mg/kg	1	<1	4	2	1
Barium, Ba	mg/kg	0.5	12	52	44	21
Boron, B	mg/kg	5	<5	<5	<5	<5
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	8.4	18	26	13
Copper, Cu	mg/kg	0.5	0.9	7.4	2.8	1.3
Lead, Pb	mg/kg	1	2	7	3	2
Manganese, Mn	mg/kg	1	47	210	150	52
Nickel, Ni	mg/kg	0.5	0.9	6.8	3.4	1.7
Selenium, Se	mg/kg	3	<3	<3	<3	<3
Zinc, Zn	mg/kg	2	<2	9	5	<2
Silver, Ag*	mg/kg	1	<1	<1	<1	<1
Iron, Fe	mg/kg	50	3900	13000	10000	4300
Strontium, Sr	mg/kg	0.5	1.3	7.4	4.2	2.9
Tin, Sn	mg/kg	3	<3	<3	<3	<3
Sodium, Na	mg/kg	10	<10	16	<10	<10
Calcium, Ca	mg/kg	5	130	1800	250	140
Magnesium, Mg	mg/kg	10	40	820	270	120
Potassium, K	mg/kg	10	79	960	400	200
Mercury in Soil Method: AN312 Tested: 30/8/2021						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Parameter	Units	LOR	Sample Number: PE154290.001 Sample Matrix: Soil Sample Date: 19/8/21 12:15 Sample Name: SM_1	PE154290.002 Soil 19/8/21 11:10 SM_2	PE154290.003 Soil 19/8/21 10:35 SM_3	PE154290.004 Soil 19/8/21 9:45 SM_4
Total Recoverable Metals in Soil by ICPMS Method: AN040/AN664V Tested: 7/9/2021						
Thorium, Th*	mg/kg	0.5	1.0	4.7	2.7	2.3
Uranium, U*	mg/kg	0.1	<0.1	0.4	0.2	0.2
Hexavalent Chromium in Soil Aquakem DA Method: AN075/AN293 Tested: 30/8/2021						
Hexavalent Chromium, Cr6+	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon by Heanes Oxidation Method: AN273 Tested: 2/9/2021						
Total Organic Carbon	%w/w	0.05	0.22	0.32	0.24	0.28
Organic Matter	%w/w	0.1	0.38	0.55	0.41	0.48
Alkalinity in Soil Method: AN002/AN135 Tested: 31/8/2021						
Bicarbonate Alkalinity as HCO3 in Soil*	mg/kg	25	<25	47	<25	<25
Carbonate Alkalinity as CO3 in Soil*	mg/kg	25	<25	<25	<25	<25
Hydroxide Alkalinity as OH in Soil*	mg/kg	25	<25	<25	<25	<25
Total Alkalinity as CaCO3 in Soil*	mg/kg	25	<25	38	<25	<25
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141 Tested: 31/8/2021						
Water Soluble Fluoride*	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Chloride (water extractable) Method: AN274 Tested: 2/9/2021						
Chloride (water extractable 1:5)*	mg/kg	5	38	11	51	26

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name SM_1	PE154290.001 Soil 19/8/21 12:15 SM_1	PE154290.002 Soil 19/8/21 11:10 SM_2	PE154290.003 Soil 19/8/21 10:39 SM_3	PE154290.004 Soil 19/8/21 9:45 SM_4
Sulfate (water extractable) in Soil Method: AN279 Tested: 2/9/2021							
Sulfate (1:5 water extractable), SO_4^{2-}	mg/kg	5		59	52	66	50
Total Oxidised Nitrogen NOx (Water Extract) in Soil Method: AN002/AN258 Tested: 1/9/2021							
Water Soluble Nitrate Nitrogen, NO_3 as N^*	mg/kg	0.025		0.060	2.5	<0.025	0.090
Water Soluble Nitrate/Nitrite Nitrogen, NO_x as N^*	mg/kg	0.025		0.77	2.7	0.80	0.59
Water Soluble ortho Phosphorus in Soil Method: AN278 Tested: 2/9/2021							
Water Soluble ortho Phosphorus, P^*	mg/kg	0.02		0.27	0.16	0.45	0.28
Water Soluble Reactive Silica by Aquakem Discrete Analyser Method: AN002/AN270 Tested: 2/9/2021							
Reactive Silica, Si^*	mg/kg	0.05		2.0	15	4.7	2.9
Reactive Silica, SiO_2^*	mg/kg	0.1		4.3	33	10	6.2
VOC's in Soil Method: AN433 Tested: 1/9/2021							
Monocyclic Aromatic Hydrocarbons							
Benzene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.2		<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Polycyclic VOCs							
Naphthalene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name SM_1	PE154290.001 Soil 19/8/21 12:15 SM_1	PE154290.002 Soil 19/8/21 11:10 SM_2	PE154290.003 Soil 19/8/21 10:39 SM_3	PE154290.004 Soil 19/8/21 9:45 SM_4
VOC's in Soil Method: AN433 Tested: 1/9/2021 (continued)							
Surrogates							
d4-1,2-dichloroethane (Surrogate)	%	-		117	108	109	106
d8-toluene (Surrogate)	%	-		115	109	109	105
Bromofluorobenzene (Surrogate)	%	-		104	96	97	92
Totals							
Total Xylenes*	mg/kg	0.3		<0.3	<0.3	<0.3	<0.3
Total BTEX*	mg/kg	0.6		<0.6	<0.6	<0.6	<0.6
Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 1/9/2021							
TRH C6-C10	mg/kg	25		<25	<25	<25	<25
TRH C6-C9	mg/kg	20		<20	<20	<20	<20
Surrogates							
d4-1,2-dichloroethane (Surrogate)	%	-		117	108	109	106
d8-toluene (Surrogate)	%	-		115	109	109	105
Bromofluorobenzene (Surrogate)	%	-		104	96	97	92
VPH F Bands							
Benzene (F0)	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
TRH C6-C10 minus BTEX (F1)	mg/kg	25		<25	<25	<25	<25
TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/9/2021							
TRH C10-C14	mg/kg	20		<20	<20	<20	<20
TRH C15-C28	mg/kg	45		<45	<45	<45	<45
TRH C29-C36	mg/kg	45		<45	<45	<45	<45
TRH C37-C40	mg/kg	100		<100	<100	<100	<100
TRH C10-C36 Total	mg/kg	110		<110	<110	<110	<110
TRH >C10-C40 Total (F bands)	mg/kg	210		<210	<210	<210	<210
TRH F Bands							
TRH >C10-C16	mg/kg	25		<25	<25	<25	<25
TRH >C10-C16 - Naphthalene (F2)	mg/kg	25		<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90		<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120		<120	<120	<120	<120

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE134293.001 Soil 18/8/21 12:15 SM_1	PE134293.002 Soil 18/8/21 11:15 SM_2	PE134293.003 Soil 18/8/21 10:33 SM_3	PE134293.004 Soil 18/8/21 9:45 SM_4
PAH (Polynuclear Aromatic Hydrocarbons) in Soil Method: AN420 Tested: 1/9/2021							
Naphthalene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0*	TEQ (mg/kg)	0.2		<0.2	<0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR*	TEQ (mg/kg)	0.3		<0.3	<0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2*	TEQ (mg/kg)	0.2		<0.2	<0.2	<0.2	<0.2
Total PAH (18)	mg/kg	0.8		<0.8	<0.8	<0.8	<0.8
Total PAH (NEPM/WHO 16)	mg/kg	0.8		<0.8	<0.8	<0.8	<0.8
Surrogates							
d5-nitrobenzene (Surrogate)	%	-		88	89	87	84
2-fluorobiphenyl (Surrogate)	%	-		81	83	83	82
d14-p-terphenyl (Surrogate)	%	-		88	92	87	90
Particle sizing of soils by sieving Method: AN005 Tested: 15/9/2021							
Passing 2.36mm	%w/w	1		100	100	100	91
Retained 2.36mm	%w/w	1		<1	<1	<1	9
Passing 600µm	%w/w	1		100	99	96	88
Retained 600µm	%w/w	1		<1	<1	4	3
Passing 300µm	%w/w	1		94	96	78	72
Retained 300µm	%w/w	1		6	3	18	17
Passing 212µm	%w/w	1		88	88	69	49
Retained 212µm	%w/w	1		27	8	20	23
Passing 75µm	%w/w	1		13	36	23	16
Retained 75µm	%w/w	1		55	52	36	33
Particle sizing of soils <75µm by hydrometer Method: AN005 Tested: 15/9/2021							
Sedimentation Diameter 1	mm	0.0001		-	0.0578	-	-
Passing Sedimentation Diameter 1	%w/w	1		-	30	-	-
Retained Sedimentation Diameter 1	%w/w	1		-	7	-	-
Sedimentation Diameter 2	mm	0.0001		-	0.0411	-	-
Passing Sedimentation Diameter 2	%w/w	1		-	28	-	-
Retained Sedimentation Diameter 2	%w/w	1		-	2	-	-
Sedimentation Diameter 3	mm	0.0001		-	0.0292	-	-
Passing Sedimentation Diameter 3	%w/w	1		-	26	-	-
Retained Sedimentation Diameter 3	%w/w	1		-	2	-	-
Sedimentation Diameter 4	mm	0.0001		-	0.0206	-	-
Passing Sedimentation Diameter 4	%w/w	1		-	24	-	-
Retained Sedimentation Diameter 4	%w/w	1		-	2	-	-
Sedimentation Diameter 5	mm	0.0001		-	0.0152	-	-
Passing Sedimentation Diameter 5	%w/w	1		-	22	-	-
Retained Sedimentation Diameter 5	%w/w	1		-	2	-	-
Sedimentation Diameter 6	mm	0.0001		-	0.0108	-	-
Passing Sedimentation Diameter 6	%w/w	1		-	22	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE154290.001 Soil 18/8/21 12:15 SM_1	PE154290.002 Soil 18/8/21 11:15 SM_2	PE154290.003 Soil 19/8/21 10:35 SM_3	PE154290.004 Soil 19/8/21 9:45 SM_4
Particle sizing of soils <75µm by hydrometer Method: AN009 Tested: 15/9/2021 (continued)							
Retained Sedimentation Diameter 6	%w/w	1		-	<1	-	-
Sedimentation Diameter 7	mm	0.0001		-	0.0076	-	-
Passing Sedimentation Diameter 7	%w/w	1		-	22	-	-
Retained Sedimentation Diameter 7	%w/w	1		-	<1	-	-
Sedimentation Diameter 8	mm	0.0001		-	0.0054	-	-
Passing Sedimentation Diameter 8	%w/w	1		-	20	-	-
Retained Sedimentation Diameter 8	%w/w	1		-	2	-	-
Sedimentation Diameter 9	mm	0.0001		-	0.0038	-	-
Passing Sedimentation Diameter 9	%w/w	1		-	19	-	-
Retained Sedimentation Diameter 9	%w/w	1		-	1	-	-
Sedimentation Diameter 10	mm	0.0001		-	0.0016	-	-
Passing Sedimentation Diameter 10	%w/w	1		-	16	-	-
Retained Sedimentation Diameter 10	%w/w	1		-	3	-	-
Sedimentation Diameter 11	mm	0.0001		-	0.0011	-	-
Passing Sedimentation Diameter 11	%w/w	1		-	14	-	-
Retained Sedimentation Diameter 11	%w/w	1		-	2	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name PE154295.005 Soil 19/8/21 9:40 SM_5	PE154295.006 Soil 19/8/21 7:30 SM_6
pH in soil (1:5) Method: AN101 Tested: 27/8/2021				
pH	pH Units	-	6.6	6.7
Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 27/8/2021				
Conductivity of Extract (1:5 as received)	µS/cm	1	20	3
Total Dissolved Solids (by calculation)	mg/kg	5	62	10
Moisture Content Method: AN002 Tested: 27/8/2021				
% Moisture	%w/w	0.5	0.9	0.9
Total Recoverable Elements in Soil by ICPOES Method: AN040/AN320 Tested: 30/8/2021				
Aluminium, Al	mg/kg	50	2000	1400
Arsenic, As	mg/kg	1	2	1
Barium, Ba	mg/kg	0.5	19	13
Boron, B	mg/kg	5	<5	<5
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	20	14
Copper, Cu	mg/kg	0.5	2.9	2.0
Lead, Pb	mg/kg	1	4	2
Manganese, Mn	mg/kg	1	160	47
Nickel, Ni	mg/kg	0.5	2.6	1.8
Selenium, Se	mg/kg	3	<3	<3
Zinc, Zn	mg/kg	2	9	<2
Silver, Ag^	mg/kg	1	<1	<1
Iron, Fe	mg/kg	50	14000	8000
Strontium, Sr	mg/kg	0.5	8.2	2.3
Tin, Sn	mg/kg	3	<3	<3
Sodium, Na	mg/kg	10	24	<10
Calcium, Ca	mg/kg	5	250	240
Magnesium, Mg	mg/kg	10	270	73
Potassium, K	mg/kg	10	330	130
Mercury in Soil Method: AN312 Tested: 30/8/2021				
Mercury	mg/kg	0.05	<0.05	<0.05

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name PE154295.005 Soil 19/8/21 9:40 SM_5	PE154295.006 Soil 19/8/21 7:30 SM_6
Total Recoverable Metals in Soil by ICPMS Method: AN040/MS44V Tested: 7/9/2021				
Thorium, Th^	mg/kg	0.5	3.4	1.9
Uranium, U^	mg/kg	0.1	0.4	0.2
Hexavalent Chromium in Soil Aquakem DA Method: AN075/AN253 Tested: 30/8/2021				
Hexavalent Chromium, Cr6+	mg/kg	0.5	<0.5	<0.5
Total Organic Carbon by Heanes Oxidation Method: AN273 Tested: 2/9/2021				
Total Organic Carbon	%w/w	0.05	0.36	0.30
Organic Matter	%w/w	0.1	0.62	0.51
Alkalinity in Soil Method: AN002/AN138 Tested: 31/8/2021				
Bicarbonate Alkalinity as HCO3 in Soil^	mg/kg	25	<25	<25
Carbonate Alkalinity as CO3 in Soil^	mg/kg	25	<25	<25
Hydroxide Alkalinity as OH in Soil^	mg/kg	25	<25	<25
Total Alkalinity as CaCO3 in Soil^	mg/kg	25	<25	<25
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141 Tested: 31/8/2021				
Water Soluble Fluoride^	mg/kg	0.5	<0.5	<0.5
Chloride (water extractable) Method: AN274 Tested: 2/9/2021				
Chloride (water extractable 1:5)^	mg/kg	5	51	84

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ANALYTICAL REPORT

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Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE154290.005 Soil 15/9/21 8:40 SM_5	PE154290.006 Soil 15/9/21 7:35 SM_6
Sulfate (water extractable) in Soil Method: AN275 Tested: 2/9/2021					
Sulfate (1:5 water extractable), SO_4^{2-}	mg/kg	5		87	57
Total Oxidised Nitrogen NOx (Water Extract) in Soil Method: AN002/AN258 Tested: 1/9/2021					
Water Soluble Nitrate Nitrogen, NO_3 as N^+	mg/kg	0.025		0.096	<0.025
Water Soluble Nitrate/Nitrite Nitrogen, NOx as N^+	mg/kg	0.025		0.77	0.85
Water Soluble ortho Phosphorus in Soil Method: AN278 Tested: 2/9/2021					
Water Soluble ortho Phosphorus, P^{3-}	mg/kg	0.02		0.40	0.51
Water Soluble Reactive Silica by Aquakem Discrete Analyser Method: AN002/AN278 Tested: 2/9/2021					
Reactive Silica, Si^{4+}	mg/kg	0.05		3.3	3.2
Reactive Silica, SiO_2	mg/kg	0.1		7.1	6.8
VOC's in Soil Method: AN433 Tested: 1/9/2021					
Monocyclic Aromatic Hydrocarbons					
Benzene	mg/kg	0.1		<0.1	<0.1
Toluene	mg/kg	0.1		<0.1	<0.1
Ethylbenzene	mg/kg	0.1		<0.1	<0.1
m/p-xylene	mg/kg	0.2		<0.2	<0.2
o-xylene	mg/kg	0.1		<0.1	<0.1
Polycyclic VOCs					
Naphthalene	mg/kg	0.1		<0.1	<0.1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE154295.005 Soil 18/8/21 8:45 SM_5	PE154290.006 Soil 19/8/21 7:30 SM_6
VOC's in Soil Method: AN433 Tested: 1/9/2021 (continued)					
Surrogates					
d4-1,2-dichloroethane (Surrogate)	%	-		108	109
d8-toluene (Surrogate)	%	-		108	108
Bromofluorobenzene (Surrogate)	%	-		94	96
Totals					
Total Xylenes*	mg/kg	0.3		<0.3	<0.3
Total BTEX*	mg/kg	0.6		<0.6	<0.6
Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 1/9/2021					
TRH C6-C10	mg/kg	25		<25	<25
TRH C6-C9	mg/kg	20		<20	<20
Surrogates					
d4-1,2-dichloroethane (Surrogate)	%	-		108	109
d8-toluene (Surrogate)	%	-		108	108
Bromofluorobenzene (Surrogate)	%	-		94	96
VPH F Bands					
Benzene (F0)	mg/kg	0.1		<0.1	<0.1
TRH C6-C10 minus BTEX (F1)	mg/kg	25		<25	<25
TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/9/2021					
TRH C10-C14	mg/kg	20		<20	<20
TRH C15-C28	mg/kg	45		<45	<45
TRH C29-C36	mg/kg	45		<45	<45
TRH C37-C40	mg/kg	100		<100	<100
TRH C10-C36 Total	mg/kg	110		<110	<110
TRH >C10-C40 Total (F bands)	mg/kg	210		<210	<210
TRH F Bands					
TRH >C10-C16	mg/kg	25		<25	<25
TRH >C10-C16 - Naphthalene (F2)	mg/kg	25		<25	<25
TRH >C16-C34 (F3)	mg/kg	90		<90	<90
TRH >C34-C40 (F4)	mg/kg	120		<120	<120

Parameter	Units	Sample Number Sample Matrix Sample Date Sample Name LOR	PE154230.005 Soil 19/8/21 8:48 SM_3	PE154230.006 Soil 19/8/21 7:38 SM_5
PAH (Polynuclear Aromatic Hydrocarbons) in Soil Method: AN420 Tested: 1/9/2021				
Naphthalene	mg/kg	0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	<0.1
Anthracene	mg/kg	0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1	<0.1
Pyrene	mg/kg	0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1
Chrysene	mg/kg	0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0*	TEQ (mg/kg)	0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR*	TEQ (mg/kg)	0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2*	TEQ (mg/kg)	0.2	<0.2	<0.2
Total PAH (18)	mg/kg	0.8	<0.8	<0.8
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8	<0.8
Surrogates				
d5-nitrobenzene (Surrogate)	%	-	83	85
2-fluorobiphenyl (Surrogate)	%	-	81	81
d14-p-terphenyl (Surrogate)	%	-	85	87
Particle sizing of soils by sieving Method: AN900 Tested: 15/9/2021				
Passing 2.36mm	%w/w	1	97	100
Retained 2.36mm	%w/w	1	3	<1
Passing 600µm	%w/w	1	94	96
Retained 600µm	%w/w	1	3	4
Passing 300µm	%w/w	1	80	81
Retained 300µm	%w/w	1	15	34
Passing 212µm	%w/w	1	65	42
Retained 212µm	%w/w	1	20	19
Passing 75µm	%w/w	1	23	15
Retained 75µm	%w/w	1	38	24
Particle sizing of soils <75µm by hydrometer Method: AN600 Tested: 15/9/2021				
Sedimentation Diameter 1	mm	0.0001	-	-
Passing Sedimentation Diameter 1	%w/w	1	-	-
Retained Sedimentation Diameter 1	%w/w	1	-	-
Sedimentation Diameter 2	mm	0.0001	-	-
Passing Sedimentation Diameter 2	%w/w	1	-	-
Retained Sedimentation Diameter 2	%w/w	1	-	-
Sedimentation Diameter 3	mm	0.0001	-	-
Passing Sedimentation Diameter 3	%w/w	1	-	-
Retained Sedimentation Diameter 3	%w/w	1	-	-
Sedimentation Diameter 4	mm	0.0001	-	-
Passing Sedimentation Diameter 4	%w/w	1	-	-
Retained Sedimentation Diameter 4	%w/w	1	-	-
Sedimentation Diameter 5	mm	0.0001	-	-
Passing Sedimentation Diameter 5	%w/w	1	-	-
Retained Sedimentation Diameter 5	%w/w	1	-	-
Sedimentation Diameter 6	mm	0.0001	-	-

Parameter	Units	LOR	Sample Number: PE154290.003 Sample Matrix: Soil Sample Date: 19/8/21 8:40 Sample Name: SM_3	Sample Number: PE154290.004 Sample Matrix: Soil Sample Date: 19/8/21 7:30 Sample Name: SM_4
Particle sizing of soils <75µm by hydrometer Method: AN003 Tested: 15/9/2021 (continued)				
Passing Sedimentation Diameter 6	Serie	1	-	-
Retained Sedimentation Diameter 6	Serie	1	-	-
Sedimentation Diameter 7	mm	0.0001	-	-
Passing Sedimentation Diameter 7	Serie	1	-	-
Retained Sedimentation Diameter 7	Serie	1	-	-
Sedimentation Diameter 8	mm	0.0001	-	-
Passing Sedimentation Diameter 8	Serie	1	-	-
Retained Sedimentation Diameter 8	Serie	1	-	-
Sedimentation Diameter 9	mm	0.0001	-	-
Passing Sedimentation Diameter 9	Serie	1	-	-
Retained Sedimentation Diameter 9	Serie	1	-	-
Sedimentation Diameter 10	mm	0.0001	-	-
Passing Sedimentation Diameter 10	Serie	1	-	-
Retained Sedimentation Diameter 10	Serie	1	-	-
Sedimentation Diameter 11	mm	0.0001	-	-
Passing Sedimentation Diameter 11	Serie	1	-	-
Retained Sedimentation Diameter 11	Serie	1	-	-

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QC SUMMARY

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MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity in Soil Method: ME-(AU)-[ENV]AN002/AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Bicarbonate Alkalinity as HCO3 in Soil*	LB187438	mg/kg	25	<25		
Carbonate Alkalinity as CO3 in Soil*	LB187438	mg/kg	25	<25		
Hydroxide Alkalinity as OH in Soil*	LB187438	mg/kg	25	<25		
Total Alkalinity as CaCO3 in Soil*	LB187438	mg/kg	25	<25	0%	NA

Chloride (water extractable) Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride (water extractable 1:5)*	LB187523	mg/kg	5	<5	22%	103%

Conductivity and TDS by Calculation - Soil Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Conductivity of Extract (1:5 as received)	LB187332	µS/cm	1	<1	3%	102%
Total Dissolved Solids (by calculation)	LB187332	mg/kg	5	<5	3%	102%

Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Water Soluble Fluoride*	LB187448	mg/kg	0.5	<0.5	0%	108%

Hexavalent Chromium in Soil Aqueous GA Method: ME-(AU)-[ENV]AN575/AN283

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Hexavalent Chromium, Cr6+	LB187359	mg/kg	0.5	<0.5	0%	100%	82%

Mercury in Soil Method: ME-(AU)-[ENV]AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Mercury	LB187357	mg/kg	0.05	<0.05	0%	96%	99%	1%

Moisture Content Method: ME-(AU)-[ENV]AN002

Parameter	QC Reference	Units	LOR	DUP %RPD
% Moisture	LB187330	%w/w	0.5	0%

pH in soil (1:5) Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH	LB187331	pH Units	-	8.2	1%	100%

Sulfate (water extractable) in Soil Method: ME-(AU)-[ENV]AN275

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Sulfate (1:5 water extractable), SO4*	LB187525	mg/kg	5	<5	29%	108%

Total Organic Carbon by Heanes Oxidation Method: ME-(AU)-[ENV]AN273

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Organic Carbon	LB187510	%w/w	0.05	<0.05	16%	96%
Organic Matter	LB187510	%w/w	0.1	<0.10	16%	96%

Total Oxidised Nitrogen NOx (Water Extract) in Soil Method: ME-(AU)-[ENV]AN002/AN058

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Water Soluble Nitrate Nitrogen, NO3- as N*	LB187464	mg/kg	0.025	<0.025		
Water Soluble Nitrate/Nitrite Nitrogen, NOx as N*	LB187464	mg/kg	0.025	<0.025	0%	100%

Total Recoverable Elements in Soil by ICP/OES Method: ME-(AU)-[ENV]AN040/AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Aluminium, Al	LB187357	mg/kg	50	<50	1%	93%	12326%	2%
Arsenic, As	LB187357	mg/kg	1	<1	1%	108%	107%	9%
Barium, Ba	LB187357	mg/kg	0.5	<0.5	0%	88%	80%	9%
Boron, B	LB187357	mg/kg	5	<5	0%	NA	71%	2%
Cadmium, Cd	LB187357	mg/kg	0.3	<0.3	0%	104%	106%	4%
Chromium, Cr	LB187357	mg/kg	0.5	<0.5	1%	75%	114%	3%
Copper, Cu	LB187357	mg/kg	0.5	<0.5	0%	104%	110%	4%
Lead, Pb	LB187357	mg/kg	1	<1	11%	107%	107%	0%
Manganese, Mn	LB187357	mg/kg	1	<1	0%	104%	-15%	-113%
Nickel, Ni	LB187357	mg/kg	0.5	<0.5	14%	104%	106%	3%
Selenium, Se	LB187357	mg/kg	3	<3	0%	118%	95%	4%
Zinc, Zn	LB187357	mg/kg	2	<2	0%	102%	106%	2%
Silver, Ag*	LB187357	mg/kg	1	<1	0%	97%	103%	0%
Iron, Fe	LB187357	mg/kg	50	<50	1%	85%	3556%	401%
Strontium, Sr	LB187357	mg/kg	0.5	<0.5	2%	101%	105%	2%
Tin, Sn	LB187357	mg/kg	3	<3	0%	79%	104%	4%
Sodium, Na	LB187357	mg/kg	10	<10	0%	89%	106%	2%
Calcium, Ca	LB187357	mg/kg	5	<5	3%	100%	53%	3%
Magnesium, Mg	LB187357	mg/kg	10	<10	2%	86%	125%	4%
Potassium, K	LB187357	mg/kg	10	<10	1%	100%	128%	4%

Water Soluble ortho Phosphorus in Soil Method: ME-(AU)-[ENV]AN278

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Water Soluble ortho Phosphorus, P*	LB187536	mg/kg	0.02	<0.02	93%

Water Soluble Reactive Silica by Aquakem Discrete Analyser Method: ME-(AU)-[ENV]AN060/AN270

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Reactive Silica, Si*	LB187533	mg/kg	0.05	<0.05	NA
Reactive Silica, SiO2*	LB187533	mg/kg	0.1	<0.10	NA

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METHOD SUMMARY

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METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN002/AN135	Alkalinity (and forms of) by Titration: The sample is extracted 1to 5 in deionised water and the extract titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN002/AN270	A 1:5 sample to DI water extract is analysed for reactive silica with results reported back to the dried sample basis. Reactive forms of silicon in acid solution below pH 2 react with ammonium molybdate ions to form a yellow silicomolybdate which is then reduced with ascorbic acid to produce a blue silicomolybdate complex. Oxalic acid is added to destroy any molybdophosphoric acid. Colourimetric determination by Aquakem Discrete Analyser.
AN005	The particle size distribution of a soil is determined by wet sieving, using a maximum of 900 mL of deionised water to sieve all fractions down to 75 µm. Referenced to AS1289.3.6.1 and AS1141.11.
AN005	Following wet sieving of the sample,(particles smaller than 75 µm) a dispersing solution is added and a hydrometer is used to measure sedimentation. Soil density is determined and the percentage of each size fraction calculated. Referenced to AS1289.3.6.3.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
AN045	A portion of sample is digested with Nitric acid and Hydrogen Peroxide over time and then with Hydrochloric acid through several heating and cooling cycles. It provides a strong oxidising medium for bringing metal analytes into solution according to USEPA3050, after filtration the solution is presented for analysis on AAS or ICP.
AN045/AN320	Solid sample is digested with HNO3 and H2O2 and completed with addition of HCl based on USEPA Method 3050. Digest is then analysed by ICP-OES. Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference USEPA3050, USEPA6010C and APHA 3120 B.
AN045/IMS84V	Determination of elements at trace level in soil digest by ICP-MS technique, Digest analysis performed by SGS Minerals division, method IMS84V.
AN075	This method uses an alkaline digestion to solubilise both water-soluble and water-insoluble forms of hexavalent chromium in solids. The solution is then pH adjusted and the hexavalent chromium concentration in solution determined colourimetrically.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.

METHOD	METHODOLOGY SUMMARY
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract of as received sample with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination , in the presence of a pH/complexation buffer, is used to determine the fluoride concentration on the soil water extract. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN258	Nitrate and Nitrite by FIA:: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Without the cadmium reduction only the original nitrite is determined. Reference APHA 4500-NO3- F.
AN273	The sample is digested in Dichromate / Sulfuric Acid to oxidise the organic carbon. The determination is completed colourimetrically by Aquakem Discrete Analyser at 600 nm. Based on Rayment & Higginson 6B1.
AN274	Chloride by Aquakem DA following 1:5 or 1:2 DI water extraction: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Results reported on dry sample basis. Reference APHA 4500Cl-
AN275	sulfate by Aquakem DA following 1:5 DI water extraction: sulfate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulfate concentration in the sample. Reference APHA 4500-SO42-. Internal reference AN275.
AN278	Reactive Phosphorus in extract by DA: Orthophosphate reacts with ammonium molybdate (Mo VI) and potassium antimonyl tartrate (Sb III) in acid medium to form an antimony-phosphomolybdate complex. This complex is subsequently reduced with ascorbic acid to form a blue colour and the absorbance is read at 880 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-P G
AN283	Hexavalent Chromium via Aquakem DA: Soluble hexavalent chromium forms a red/violet colour with diphenylcarbazide in acidic solution. This procedure is very sensitive and nearly specific for Cr6+. If total chromium is also measured the trivalent form of chromium Cr3+ can be calculated from the difference (Total Cr - Cr6+). Reference APHA3500Cr-B.
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .

METHOD	METHODOLOGY SUMMARY
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRH-Si) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN420	Carcinogenic PAHs may be expressed as Benzo(a)pyrene equivalents by applying the BaP toxicity equivalence factor (NEPM 1999, June 2013, B7). These can be reported as the individual PAHs and as a sum of carcinogenic PAHs. The sum is reported three ways, the first assuming all <LOR results are zero, the second assuming all < LOR results are half the LOR and the third assuming all <LOR results are the LOR.
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

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FOOTNOTES

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FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
***	Indicates that both * and ** apply.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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Appendix G. 2023 Soil Samping and Profile (Gemec 2023)

20 October 2023

Bennett Resources Pty Ltd
Level 14, 225 St Georges Terrace
Perth WA 6000

Re: Targeted Soil & Groundwater Works – Valhalla Gas Exploration & Appraisal Program

Please see below a summary of targeted soil and groundwater works undertaken by Gemec for the Valhalla Gas Exploration and Appraisal Program (the Proposal) on 25-26 July 2023.

Gemec was engaged by Bennett Resources Pty Ltd (BNR) to undertake down-hole inspection of four groundwater monitoring wells at the Agard 1 and Valhalla North 1 wellsites, and the excavation and sampling of one soil borehole at the Proposed Well 3 location. The sites are located within the petroleum Exploration Permit EP 371, situated in the in the locality of Mount Hardman, Shire of Derby-West Kimberley, Western Australia.

The Proposal is to complete an unconventional exploration and appraisal drilling and Hydraulic Fracture Stimulation (HFS) program within EP 371 in the Canning Basin. A total of 20 exploration wells are proposed to be constructed at 10 well sites (Figure 1) within the Development Envelope. At the time of the works the Proposal is being assessed by the EPA (Assessment 2281).

1. Purpose

The purpose of the works was to determine whether the construction and condition of existing groundwater monitoring wells is appropriate for baseline groundwater assessment purposes, and to establish a baseline soil data set.

2. Scope of Works

The following activities were carried out as part of the scope of work:

- mobilised personnel and equipment to site;
- completed an occupational health and safety plan for the proposed works;
- inspected four groundwater monitoring wells via down-hole camera;
- excavated one soil borehole to a total depth of 2.0 metres below ground surface;
- undertook sufficient quality assurance (QA) and quality control (QC) procedures to ensure the soil assessment was representative;
- collected two representative primary soil samples and two QC samples from the soil borehole, chilled and transported the samples under chain of custody (CoC) protocols to National Association of Testing Authorities (NATA) accredited laboratories for analysis; and
- prepared a report detailing the field activities, analytical results, conclusions and any recommendations.

Field work was undertaken by an experienced Contaminated Land Consultant from Gemec's Perth office in accordance with the various standards and guidelines referenced in s. 5 (References) and Gemec's Protocols.

3. Soil Assessment

The soil borehole SB1 was excavated from the Proposed Well 3 wellsite shown on the attached Figure 1. The location was chosen as its surface geology and soil landscape are each one of the two most widespread throughout the Proposal area.

- Surface geology: 'Dunes' – sandplain with dunes and swales, may include numerous interdune claypans, may be locally gypsiferous (Geoscience Australia, 2023).
- Soil landscape: 'Camelgooda System' – sandplains, swales and linear sand dunes supporting low pindan woodlands of acacias and low woodlands of bauhinia and bloodwood with curly spinifex and ribbon grass (DPIRD, 2023).
- Land type: sandplains and dunes, pindan woodlands and spinifex/tussock grasslands (DPIRD, 2023).

3.1 Methodology

SB1 was excavated using a 75 mm Ø stainless-steel hand auger. A fresh pair of disposable nitrile gloves was worn for each sample collection and the hand auger was decontaminated prior to and post sampling by washing with a laboratory grade phosphate free detergent solution (Quantumclean®) and rinsing with tap water. The soil samples were collected in laboratory supplied sample containers, chilled following collection and sent under CoC documentation to NATA accredited laboratories for testing. The sample containers were marked with an identifying number, depth and date.

The two sample depths aimed to capture variation through the upper soil profile, at depths that are most likely to be exposed to Chemicals of Potential Concern (CoPC) originating from wellsite activities. The samples were collected from the soil surface at 0-0.3 metres below ground surface (m bgs) and at 1.7-2.0 m bgs.

3.2 Sample Analytical Suites

The CoPC selected for assessment are associated with future potential contaminant sources at each wellsite. Additional physical and chemical analyses were used to further define the nature of the soil and to allow for the calculation of site-specific screening levels.

Both primary soil samples were submitted for analysis of the following:

- Petroleum hydrocarbon compounds including benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN) and total recoverable hydrocarbon (TRH) fractions in the C6-C40 carbon chain range;
- metals, metalloids and non-metals including aluminium, arsenic, barium, boron, cadmium, chromium, hexavalent chromium, copper, iron, lead, manganese, mercury, nickel, selenium, strontium, thorium, tin, uranium and zinc;
- nutrients including total nitrogen, total Kjeldahl nitrogen (TKN), ammonia, nitrate, nitrite, total phosphorous and phosphate;
- miscellaneous inorganics including sulfur, fluoride and total cyanide; and
- soil characteristics including pH, electrical conductivity (EC), cation exchange capacity (CEC), clay content, total organic carbon (TOC) and organic matter (TOM).

The analytical procedures used by the laboratories undertake determinations in accordance with the following internationally recognised procedures – NEPM, US EPA, APHA and AS.

3.3 Soil Screening Levels

Soil sample concentrations were compared against site screening levels for the protection of ecological and human health as per the 2021 Department of Water and Environmental Regulation (DWER) *Assessment and management of contaminated sites* guideline, which references screening levels detailed in the *National Environment Protection (Assessment of Site Contamination) Measure* (ASC NEPM – NEPC, 2013).

The selected soil screening levels are presented in the attached Tables and were based on the use of the site and surrounds for broad scale agriculture. The screening level guidelines are presented in the References section (s. 5).

3.4 Quality Control

Quality control samples included blind field replicates (Dup and Split), a Rinsate and a Trip Blank sample. The results of each of these are presented in the attached Tables and Appendix A. The absence of analytes detected in the Rinsate and Trip Blank suggest that no cross contamination occurred via equipment, storage or transport. Most relative percentage difference values for the Dup and Split samples were below 50%, and those above 50% weren't considered significant as the value was within 10x the laboratory limit of reporting (LoR). This suggests an adequate level of repeatability of the sampling procedure, and homogeneity of the samples collected.

Laboratory outliers were reported for holding times (pH, EC, phosphate and nitrite) and matrix spike recovery (TKN, sulfur, aluminium, iron, manganese, zinc). The holding times will be taken into consideration for future assessment, whereas the matrix spike recovery wasn't considered applicable due to the high analyte background in the sample and the laboratory control sample being within acceptance criteria. By signing the laboratory reports the laboratories acknowledge that the results satisfy their NATA accreditation.

3.5 Results

Results are discussed in context of the following attachments:

- Soil analytical results: Tables 1-3.
- Laboratory analytical reports: Appendix A.
- Soil sample location: Figure 1.
- Site photographs: Appendix C

The soil was observed as brown, fine to medium grain silty clayey sand at the surface, and with depth it tended toward brownish red, a higher clay content and damp. The observations and soil characteristics were consistent with those expected for the surface geology and soil landscape described above – including a slightly acidic pH (6.2-6.5), low EC (3.3-4.7 µS/cm), CEC (1.1 meq/100 g) and clay content (1-7%).

Concentrations of the nutrients total nitrogen, TKN, ammonia and phosphorus were detected in both samples, with traces of sulfur and fluoride detected only the surface sample (Split). Cyanide was not detected.

Hydrocarbons as BTEXN and TRH were not detected in either soil sample.

The metals signature was dominated by aluminium and iron as expected, with barium, chromium, copper, lead, manganese, nickel, strontium, thorium, uranium and zinc also detected in both the shallow and deeper samples, with the majority of metals higher in concentration at depth.

4. Groundwater Monitoring Well Inspection

A down-hole camera was used to inspect each of the following pairs of nested groundwater monitoring wells, the locations of which are presented on the attached Figures 2 and 3:

- Asgard 1 wellsite: AB1S and AB1D; and
- Valhalla North 1 wellsite: VNB4S and VNB4D.

These groundwater monitoring wells are intended to be used to establish a baseline data set for the Proposal area, due to their up-hydraulic gradient position (inferred) with respect to site contaminant sources, and are therefore not considered to be impacted from historical wellsite activities, as supported by historical groundwater data obtained from these locations. Each groundwater monitoring well is understood to intercept the uppermost aquifer at each location – the Liveringa (Rockwater, 2016).

4.1 Results

Photographs obtained from down-hole camera footage are Attached in Appendix C to support the below observations and resultant construction details.

Field measured groundwater monitoring well construction details.

Site	Asgard 1	Asgard 1	Valhalla North 1	Valhalla North 1
Well reference	AB1S	AB1D	VNB4S	VNB4D
Coordinates (MGA2020 Zone 51)	714813 m N 7981398 m E	714815 m N 7981398 m E	683175 m N 8006123 m E	683177 m N 8006123 m E
Stick up (m ags)	0.5	0.7	0.5	0.7
Screened interval (m btoc)	30.8-36.3	67.0-76.6	36.6-42.3	66.9-78.4
Measured depth of well (m btoc)	36.3	76.6	42.3	78.4
Construction materials [1]	Class 18 uPVC casing, 96 mm ID, 114 mm OD, slotted intervals with 1.0 mm aperture.			
Standing water level (m btoc)	23.070	21.780	30.686	30.956
Head volume (L)	96	397	84	343
Aquifer	Liveringa	Liveringa	Liveringa	Liveringa

Notes: 1 – Construction materials and diameter were observed in the field and confirmed to be in conformance with the Buru conceptual design presented in Appendix B. Refer to the Buru conceptual design for further details such as gravel pack and bentonite seals, the depths of which will be in relation to depth to the top of screen.

'm ags' denotes metres above ground surface.

'm btoc' denotes metres below top of casing.

Based on the recorded down-hole camera footage, the condition of the construction materials of each of the four groundwater monitoring wells was good – there did not appear to be any noteworthy damage to any of the PVC monitor well casings. Some minor scratches were evident.

A partial organic build up was observed within slots in the lower extents of the screened interval of each well, and insect debris was observed on the casing walls of both deep wells (AB1D, VNB4D) – particularly in proximity to the SWL. A film of insect debris was observed on the groundwater surface at each of these two locations and organic debris appears to have settled at the base of each of the four wells.

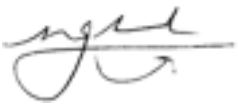
While organic debris may be detected in groundwater samples as trace levels of TRH, and may go on to decompose to form traces of methane, each of these detections are easily discernible from the considerable changes that would occur to groundwater chemistry from gas wellsite contamination. This is supported by groundwater monitoring data obtained from the site to-date. As such, each of the wells are considered appropriate for ongoing representative groundwater monitoring of the surrounding aquifer.

During future wellsite establishment, opportunistic groundwater monitoring bore redevelopment may be undertaken via the use of groundwater abstraction pumps. This would allow for the purging of organic debris from each bore. Additional redevelopment methodology may be applied, however is not consider necessary.

Gemec have appreciated the opportunity to provide our professional services to Bennett Resources for this project.

Please contact me if you require any other information or clarification of the above.

Regards,



Nicolo Jelovsek BSc
Director, Contaminated Land Consultant

5. References

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US EPA, 2005, *Interim Ecological Soil Screening Level Documents,* United States Environmental Protection Agency.

Verbruggen E.M.J. *et a*l, April 2001, *Ecotoxicological Serious Risk Concentrations for soil, sediment and (ground)water: updated proposals for first series of compounds* – RIVM (National Institute of Public Health and the Environment) report 711701 020.

6. Limitations of Report

This report pertains to the Valhalla Project only, as identified herein.

The findings and conclusions given in this report are based on the site conditions and those applicable Government regulations that existed at the time the environmental investigation was conducted, and this report prepared. This report was prepared in accordance with accepted environmental practices used by environmental professionals undertaking projects of a similar nature.

Environmental investigation identifies subsurface conditions only at those locations where samples are taken and at the time they are taken. Decisions should not be made on the basis of this report if adequacy of the report has been affected by time as the report is based on conditions that existed at the time the site was investigated.

Gemec warrant that the environmental investigation and the assessments presented in this report identifies actual subsurface conditions at the location investigated and at the time the investigation was undertaken. No other warranty as to the accuracy and completeness, express or implied, is made as to any advice included in this report. While every effort has been made to ensure accuracy, no liability is accepted for errors of fact or opinion herein.

This report was prepared for use by the client, Bennett Resources Pty Ltd and shall only be used by the client for the purpose or purposes that this report was bought into existence. All third parties rely on this report at their own risk. This report is not intended as a substitute for legal advice which can be given only by a qualified legal practitioner.

Attachments

Tables

Table 1 Soil Analytical Results – BTEXN & TRH

Table 2 Soil Analytical Results – Metals, Metalloids & Non-Metals

Table 3 Soil Analytical Results – Soil Characteristics, Nutrients & Miscellaneous Inorganics

Figures

Figure 1 Regional Site Setting & Wellsite Locations, July 2023

Figure 2 Valhalla North 1 Groundwater Monitoring Locations, July 2023

Figure 3 Asgard 1 Groundwater Monitoring Locations, July 2023

Appendix A – Analytical Results

Chain of Custody Forms and Laboratory Reports

Appendix B – Supporting Data

- Soil Bore Log
- Buru Energy Monitoring Bore Conceptual Design
- Field Equipment Calibration Certificates
- Field Data Sheets
- HSL Application Checklist

Appendix C – Site Photographs

Tables

Table 1: Soil Analytical Results - BTEXN & TRH

Sample ID	Depth (m)	Date	Time	PID	BTEXN						TRH					
					Benzene	Toluene	Ethylbenzene	m+p Xylenes	o- Xylenes	Naphthalene [1]	C6-C10	C6-C10 less BTEX	>C10-C16	>C10-C16 less naphthalene	>C16-C34	>C34-C40
SB1	0-0.3	25.07.23	15:32	0.0	<0.20	<0.50	<1.0	<2.0	<1.0	<1.0	<25	<25	<50	<50	<100	<100
		Dup			*<0.20*	*<0.50*	*<1.0*	*<2.0*	*<1.0*	*<1.0*	*<25*	*<25*	*<50*	*<50*	*<100*	*<100*
		RPD			*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
		Split			*<0.2*	*<0.5*	*<1*	*<2*	*<1*	*<1*	*<25*	*<25*	*<50*	*<50*	*<100*	*<100*
		RPD			*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
	1.7-2.0	25.07.23	15:43	0.0	<0.20	<0.50	<1.0	<2.0	<1.0	<1.0	<25	<25	<50	<50	<100	<100
Trip Blank	-	25.07.23	14:30	-	<0.20	<0.50	<1.0	<2.0	<1.0	<1.0	<25	<25	-	-	-	-
ESL - Urban Residential & Public Open Space [2, 3]					50	85	70	105		170 [4]	NE	180	120	NE	300	2800
HSL C (Vapour Intrusion) - Recreational / Open Space [3]					NL	NL	NL	NL		NL	NE	NL	NE	NL	NE	NE
HSL C (Direct Contact) - Recreational / Open Space					430	99000	27000	81000		11000	26000	NE	20000	NE	27000	38000
Management Limits - Residential, Parkland, Public Open Space [3]					NE	NE	NE	NE		NE	700	NE	1000	NE	2500	10000
SL-A - Agricultural					0.07	120	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Laboratory Limit of Reporting					0.2	0.5	0.5	0.5	0.5	1	10	10	50	50	100	100

Notes

All concentrations reported in milligrams per kilogram (mg/kg) on a dry weight basis
'ESL' denotes Ecological Screening Level
'HSL' denotes Health Screening Level
'NA' denotes not applicable - primary and QC sample concentration below laboratory LoR
'NE' denotes screening level not established or is under review
'NL' denotes screening level not limiting
'RPD' denotes relative percentage difference
'-' denotes not tested / parameter not obtained

1. volatile extraction method
2. ESLs apply to top 2 m of soil profile
3. screening level for coarse / sandy soils
4. EIL for fresh naphthalene

Table 2: Soil Analytical Results - Metals, Metalloids & Non-Metals

Sample ID	Depth (m)	Date	Time	Aluminium (Al)	Arsenic (As)	Barium (Ba)	Boron (B)	Cadmium (Cd)	Chromium (Cr)	Hexavalent Chromium (CrVI)	Copper (Cu)	Iron (Fe)	Lead (Pb)	Manganese (Mn)	Mercury (Hg)	Nickel (Ni)	Selenium (Se)	Strontium (Sr)	Thorium (Th)	Tin (Sn)	Uranium (U)	Zinc (Zn)
SB1	0-0.3	25.07.23	15:32	**2000**	<4.0	**14**	<10	<0.40	**17**	<1.0	**1.4**	**5900**	**3**	**69**	<0.10	**1.8**	<2.0	**2.1**	**1.7**	<2.0	**0.17**	**1.6**
		Dup		***2100***	*<4.0*	***14***	*<10*	*<0.40*	***18***	*-*	***1.4***	***5800***	***3***	***68***	*<0.10*	***1.8***	*<2.0*	***2.1***	***1.8***	*<2.0*	***0.21***	***1.6***
		RPD		*5*	*NA*	*0*	*NA*	*NA*	*6*	*-*	*0*	*2*	*0*	*1*	*NA*	*0*	*NA*	*0*	*6*	*NA*	*21*	*0*
		Split		***1400***	*<4*	***13***	*<10*	*<0.4*	***15***	*-*	***2***	***5400***	***2***	***69***	*<0.1*	***2***	*<2*	***2***	***1***	*<2*	*-*	***1***
		RPD		*35*	*NA*	*7*	*NA*	*NA*	*13*	*-*	*35*	*9*	*40*	*0*	*NA*	*11*	*NA*	*5*	*52*	*NA*	*-*	*46*
	1.7-2.0	25.07.23	15:43	**3600**	<4.0	**12**	<10	<0.40	**19**	<1.0	**1.3**	**9600**	**3.8**	**22**	<0.10	**3**	<2.0	**2.1**	**2.5**	<2.0	**0.21**	**5.2**
Rinsate	-	25.07.23	16:15	<10	-	-	-	-	<1.0	-	<1.0	<10	<1.0	<1.0	-	-	-	-	-	-	-	<1.0
EIL - Urban Residential & Public Open Space [1]				NE	100	765 [2]	NE	12 [2]	310 [4,5]	130 [3]	20 [5]	NE	1100	220 [3]	36 [2,6]	4 [5]	4 [3]	NE	NE	NE	NE	60 [5]
HIL C - Recreational / Open Space				NE	300	NE	20000	90	NE	300	17000	NE	600	19000	80 [6]	1200	700	NE	NE	NE	NE	30000
SL-A - Agricultural				NE	12	NE	NE	1.4	64	0.4	NE	NE	70	NE	6.6 [6]	NE	NE	NE	NE	NE	23	NE
Laboratory Limit of Reporting				50	5	10	50	1	2	0.5	5	50	5	5	0.1	2	5	2	10	0.1	5	5

Notes

All soil concentrations reported in milligrams per kilogram (mg/kg) on a dry weight basis, rinsate concentrations reported in micrograms per litre (µg/L)

'EIL' denotes Ecological Investigation Level

'HIL' denotes Health Investigation Level

'NA' denotes not applicable - primary and QC sample concentration below laboratory LoR

'NE' denotes screening level not established or is under review

'RPD' denotes relative percentage difference

'-' denotes not tested / parameter not obtained

1. EILs apply to upper 2 m of soil profile
2. Dutch SRCeco value based on ABC, 4% clay content, 0.54% total organic matter
3. US EPA Eco SSL for Plants, Soil Invertebrates or Mammals
4. screening level for trivalent chromium Cr(III)
5. screening level derived using average ABCs, 4% clay, pH 5.3 & 1.1 meq/100g CEC
6. value for inorganic mercury

Table 3: Soil Analytical Results - Soil Characteristics, Nutrients & Miscellaneous Inorganics

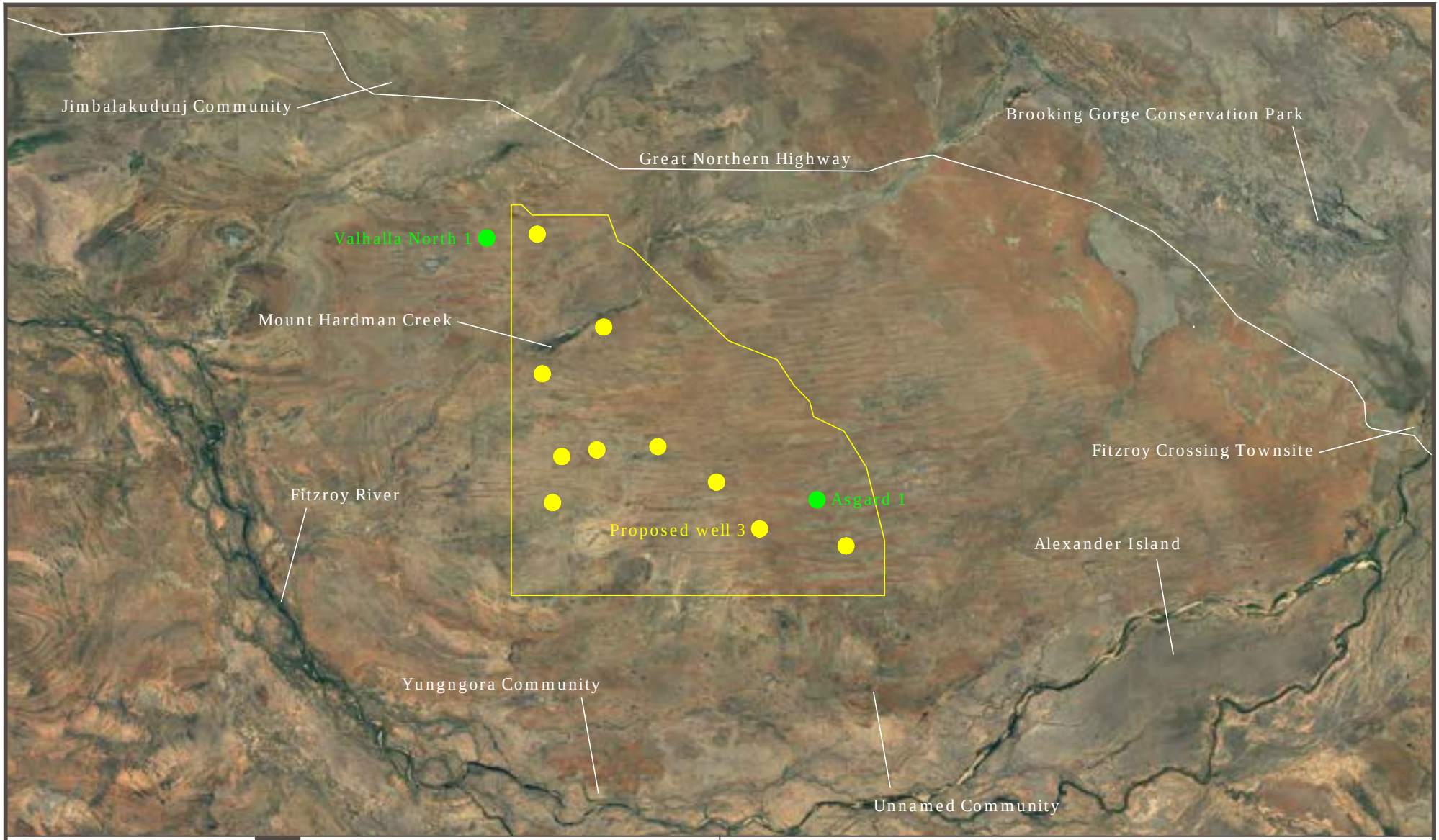
Sample ID	Depth (m)	Date	Time	Soil Characteristics									Nutrients							Miscellaneous		
				Moisture Content (%)	pH	pH ($CaCl_2$ extract)	Electrical Conductivity (µS/cm)	Cation Exchange Capacity (meq/100 g)	Clay (<2 µm) (%)	Soil Particle Density (Clay/Silt/Sand) (g/cm^3)	Total Organic Carbon (%)	Organic Matter (%)	Total Nitrogen (as N)	Total Kjeldahl Nitrogen (as N)	Ammonia (as N)	Nitrate (as N)	Nitrite (as N)	Total Phosphorus (as P)	Phosphate (as P)	Sulfur (S)	Fluoride (F^-)	Total Cyanide (CN^-)
SB1	0-0.3	25.07.23	15:32	**1.6**	**6.2**	**4.9**	**3.3**	**1.1**	**1**	**2.6**	**0.38**	**0.66**	**100**	**100**	**1.4**	<0.50	<0.50	**24**	<0.50	<10	<0.50	<0.50
		Dup		***1.3***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*<10*	*<0.50*	-
		RPD		*21*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
		Split		***0.9***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***10***	***1***	-
		RPD		*56*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
	1.7-2.0	25.07.23	15:43	**2.6**	**6.5**	**5.7**	**4.7**	**1.1**	**7**	**2.6**	**0.25**	**0.42**	**96**	**96**	**1.1**	<0.50	<0.50	**17**	<0.50	<10	<0.50	<0.50
EIL - Urban Residential & Public Open Space [1]				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	2000 [2]	NE	NE	NE	NE
HIL C - Recreational / Open Space				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	240
SL-A - Agricultural				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	200	NE
Laboratory Limit of Reporting				0.1	0.1	0.1	2	0.1	1	0.1	0.01	0.01	10	10	0.5	0.5	0.5	10	0.5	10	0.5	0.5

Notes

All concentrations reported in milligrams per kilogram (mg/kg) on a dry weight basis, unless stated otherwise
'EIL' denotes Ecological Investigation Level
'HIL' denotes Health Investigation Level
'NA' denotes not applicable - primary and QC sample concentration below laboratory LoR
'NE' denotes screening level not established or is under review
'RPD' denotes relative percentage difference
'-' denotes not tested / parameter not obtained

1. EILs apply to top 2 m of soil profile
2. 1999 NEPM Interim Urban value

Figures



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Development Envelope
Proposed well site
Existing / former well site

0 20
Scale (km), approx.

Regional Site Setting & Wellsite Locations, July 2023
Valhalla Gas Exploration & Appraisal Program
Shire of Derby-West Kimberley, Western Australia

Drawn: DB	Date: 08.08.2022	Checked	Approved	Dwg No.	Figure 1
Source: Nearmap, May 2022		NJ	NJ		

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Gas well
Groundwater sample location

0 50
Scale (m), approx.

Valhalla North 1 Groundwater Monitoring Locations, July 2023
Valhalla Gas Exploration & Appraisal Program
Shire of Derby-West Kimberley, Western Australia

Drawn: DB	Date: 08.08.2022	Checked NJ	Approved NJ	Dwg No. Figure 2
Source: Nearmap, 23 May 2023				

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Gas well
Groundwater sample location

0 50
Scale (m), approx.

Asgard 1 Baseline Groundwater Monitoring Locations, July 2023

Valhalla Gas Exploration & Appraisal Program

Shire of Derby-West Kimberley, Western Australia

Drawn: DB	Date: 08.08.2022	Checked	Approved	Dwg No.	Figure 3
Source: Nearmap, 23 May 2023		NJ	NJ		

Appendix A – Analytical Results

CHAIN OF CUSTODY - Client

Client: Gemec
Project Mgr: Nicolo Jelovsek
Sampler: Nicolo Jelovsek
Address: 1/25 Foss St Palmyra 6157
Email: nicolo@gemec.com.au
Phone: 08 9339 8449 / 0439 093 980

Client Project Name and Number: BME - Valhalla
Location: Valhalla Proposed Well 3
MPL Quote No: 22PE483
Date results required:
Or choose: standard ~~/ 1 day / 2 day / 3 day~~
Note: Inform lab in advance if urgent turnaround is required - surcharge applies

MPL Laboratories
Address: 16-18 Hayden Crt
Myaree 6154
Phone: 08 9317 2505
Fax: 08 9317 4163
E-mail: lab@mpl.com.au

Sample information | **Analyses Required** | **Comments**

MPL Sample ID	Client Sample ID	Depth (m)	Date sampled	Time	Type of sample	CS001_M: BTEXN, TRH, 8 metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	Extra metals: Al, Ba, B, Fe, Mn, S, Se, Sn, Sr, Th, U, Zn	Hexavalent chromium	Cyanide (total)	Fluoride	E010302: Nutrient suite	pH & EC	vTRH (C6-C9) + BTEXN	8 metals: Al Cu Cr Fe Pb Mn S Zn (total) - excl. CrVI	SS350: NEPM2013 Soil Characteristics EIL			
1	SB1	0-0.3	25.07.23	15:32	Soil	X	X	X	X	X	X	X			X			
2	SB1	1.7-2.0	25.07.23	15:43	Soil	X	X	X	X	X	X	X			X			
3	Dup	-	25.07.23	-	Soil	X	X			X								
4	Trip Blank	-	25.07.23	14:30	Soil								X					
5	Rinsate	-	25.07.23	16:15	Water									X				

Comments
Email CoC with report also please
Sample containers labelled VDE

mpl Laboratories ENVIROLAB
Job No.- PEG164
Date Rec - 28 JUL 2023
Time Rec - 1135
Rec By - SJM
TAT Req - SAME 1 / 2 / 3 / STD
Temp - cool / ambient 8°C
Cooling - Ice / Ice pack / None
Security Seal - Yes / No

Relinquished by (company): Gemec
Print Name: Nicolo Jelovsek
Date & Time: 28.07.23, 10:00
Signature:

Received by (company): MPL
Print Name: SJM
Date & Time: 28 JUL 2023 - 1135
Signature: SJM

Laboratory Use Only:
Samples Received: Cool / ambient
Temperature Received at: 8°C (if applicable)
Transported by: Hand delivered / courier

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
ABN 53 140 099 207
16-18 Hayden Court Myaree WA 6154
ph +61 8 9317 2505 fax +61 8 9317 4163
lab@mpl.com.au
www.mpl.com.au

Sample Receipt Advice PEG1691

Client Details

Client	Gemec
Attention	Nicolo Jelovsek

Sample Login Details

Your Reference	BME - Valhalla - Valhalla Proposed Well 3
Envirolab Reference	PEG1691
Date Sample Received	28/07/2023
Date Instructions Received	28/07/2023
Date Final Results Expected	04/08/2023

Sample Condition

Samples received in appropriate condition for analysis	See Comments
Number of Samples	4 Soil, 1 Water
Turnaround Time	5 Days
Temperatures / Cooling Methods	8.0°C Ice Pack

Additional Info

Sample storage - waters are routinely disposed at approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Where no sampling date has been supplied for some or all samples, the date of sample receipt has been used as the associated sampling date. The sampling dates are used to assess compliance to recommended Technical Holding Times.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

Please direct any queries to:

Heram Halim

Phone	08 9317 2505
Fax	08 9317 4163
Email	hhalim@mpl.com.au

Meredith Conroy

Phone	08 9317 2505
Fax	08 9317 4163
Email	mconroy@mpl.com.au

Analysis underway, details on the following page

Sample Receipt Advice PEG1691

Analysis Grid

The • indicates the testing you have requested. ***THIS IS NOT A REPORT OF THE RESULTS.***

	Nutrient Suite	NEPM2013 EIL	Suite 1 - Soil	vTRH&MBTEXN	Metals	Total Metals	Metals (LL)	Total Metals (LL)	EC	pH	Cr6+	Fluoride	Moisture	Cyanide - Total	1:5 Soil:Water Extraction
PEG1691-01 Soil | 25/07/2023 SB1 | 0.0m-0.3m	•	•	•		•		•		•	•	•	•	•	•	
PEG1691-02 Soil | 25/07/2023 SB1 | 1.7m-2m	•	•	•		•		•		•	•	•	•	•	•	
PEG1691-03 Soil | 25/07/2023 Dup			•		•		•					•	•		•
PEG1691-04 Soil | 25/07/2023 Trip Blank				•									•		
PEG1691-05 Water | 25/07/2023 Rinsate						•		•							

Suite Details

Suite Name	Suite Analyses
Nutrient Suite|Soil	P, 1:5 Soil:KCl Extraction, 1:5 Soil:Water Extraction, Phosphate as P, Nitrogen - Ammonia, Nitrogen - Nitrate, Nitrogen - Nitrite, Nitrogen - NOx, Nitrogen - TKN, Organic Nitrogen, Total Nitrogen - calc
NEPM2013 EIL|Soil	Fe, CEC, Exchangeable Cations, CaCl2 Soil Extraction, OC Walkley Black, TOC Walkley Black, TOM Walkley Black, Clay Content, Particle Density, pH CaCl2
Suite 1 - Soil|Soil	vTRH&MBTEXN, sTRH, As, Cd, Cr, Cu, Hg, Ni, Pb, Zn

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lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PEG1691

Client Details

Client	Gemec
Contact	Nicolo Jelovsek
Address	1/25 Foss St, PALMYRA, WA, 6157

Sample Details

Your Reference	BME - Valhalla - Valhalla Proposed Well 3
Number of Samples	4 Soil, 1 Water
Date Samples Received	28/07/2023
Date Samples Registered	28/07/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	04/08/2023
Date of Issue	04/08/2023

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Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Diego Bigolin, Supervisor, Inorganics Heram Halim, Operations Manager Lien Tang, Assistant Operations Manager Michael Mowle, Inorganics Supervisor Stacey Hawkins, ASS/AMD Supervisor Todd Lee, Group Operations Manager Travis Carey, Organics Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEG1691

Samples in this Report

Envirolab ID	Sample ID	Depth	Matrix	Date Sampled	Date Received
PEG1691-01	SB1	0.00-0.30Meters	Soil	25/07/2023	28/07/2023
PEG1691-02	SB1	1.70-2.00Meters	Soil	25/07/2023	28/07/2023
PEG1691-03	Dup		Soil	25/07/2023	28/07/2023
PEG1691-04	Trip Blank		Soil	25/07/2023	28/07/2023
PEG1691-05	Rinsate		Water	25/07/2023	28/07/2023

Volatile TRH and BTEX (Soil)

Envirolab ID	Units	PQL	ADWG	PEG1691-01	PEG1691-02	PEG1691-03	PEG1691-04
Your Reference			Health	SB1	SB1	Dup	Trip Blank
Date Sampled			Value	25/07/2023	25/07/2023	25/07/2023	25/07/2023
Depth				0.00-0.30	1.70-2.00		
TRH C6-C9	mg/kg	25		<25	<25	<25	<25
TRH C6-C10	mg/kg	25		<25	<25	<25	<25
TRH C6-C10 less BTEX (F1)	mg/kg	25		<25	<25	<25	<25
Methyl tert butyl ether (MTBE)	mg/kg	0.50		<0.50	<0.50	<0.50	<0.50
Benzene	mg/kg	0.20		<0.20	<0.20	<0.20	<0.20
Toluene	mg/kg	0.50		<0.50	<0.50	<0.50	<0.50
Ethylbenzene	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
meta+para Xylene	mg/kg	2.0		<2.0	<2.0	<2.0	<2.0
ortho-Xylene	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Total Xylene	mg/kg	3.0	600	<3.0	<3.0	<3.0	<3.0
Naphthalene (value used in F2 calc)	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%			90.3	102	104	98.7

Semi-volatile TRH (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02	PEG1691-03
Your Reference			SB1	SB1	Dup
Date Sampled			25/07/2023	25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00	
TRH C10-C14	mg/kg	50	<50	<50	<50
TRH C15-C28	mg/kg	100	<100	<100	<100
TRH C29-C36	mg/kg	100	<100	<100	<100
Total +ve TRH C10-C36	mg/kg	50	<50	<50	<50
TRH >C10-C16	mg/kg	50	<50	<50	<50
TRH >C10-C16 less Naphthalene F2	mg/kg	50	<50	<50	<50
TRH >C16-C34 (F3)	mg/kg	100	<100	<100	<100
TRH >C34-C40 (F4)	mg/kg	100	<100	<100	<100
Total +ve TRH >C10-C40	mg/kg	50	<50	<50	<50
Surrogate o-Terphenyl	%		101	94.7	94.7

Acid Extractable Metals (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02	PEG1691-03
Your Reference			SB1	SB1	Dup
Date Sampled			25/07/2023	25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00	
Aluminium	mg/kg	10	2000	3600	2100
Arsenic	mg/kg	4.0	<4.0	<4.0	<4.0
Boron	mg/kg	10	<10	<10	<10
Barium	mg/kg	1.0	14	12	14
Cadmium	mg/kg	0.40	<0.40	<0.40	<0.40
Chromium	mg/kg	1.0	17	19	18
Copper	mg/kg	1.0	1.4	1.3	1.4
Iron	mg/kg	10	5900	9600	5800
Mercury	mg/kg	0.10	<0.10	<0.10	<0.10
Manganese	mg/kg	1.0	69	22	68
Nickel	mg/kg	1.0	1.8	3.2	1.8
Phosphorus	mg/kg	10	24	17	[NA]
Lead	mg/kg	1.0	3.0	3.8	3.0
Sulfur	mg/kg	10	<10	<10	<10
Selenium	mg/kg	2.0	<2.0	<2.0	<2.0
Tin	mg/kg	2.0	<2.0	<2.0	<2.0
Strontium*	mg/kg	1.0	2.1	2.1	2.1
Zinc	mg/kg	1.0	1.6	5.2	1.6

Acid Extractable Metals (Water)

Envirolab ID	Units	PQL	PEG1691-05
Your Reference			Rinsate
Date Sampled			25/07/2023
Sulfur	mg/L	0.50	<0.50

Acid Extractable Low Level Metals (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02	PEG1691-03
Your Reference			SB1	SB1	Dup
Date Sampled			25/07/2023	25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00	
Thorium	mg/kg	0.50	1.7	2.5	1.8
Uranium	mg/kg	0.10	0.17	0.21	0.21

Acid Extractable Low Level Metals (Water)

Envirolab ID	Units	PQL	ADWG	PEG1691-05
Your Reference			Health	Rinsate
Date Sampled			Value	25/07/2023
Aluminium	µg/L	10		<10
Chromium	µg/L	1.0		<1.0
Copper	µg/L	1.0	2000	<1.0
Iron	µg/L	10		<10
Manganese	µg/L	1.0	500	<1.0
Lead	µg/L	1.0	10	<1.0
Zinc	µg/L	1.0		<1.0

Exchangeable Cations (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02
Your Reference			SB1	SB1
Date Sampled			25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00
Calcium	meq/100g	0.10	0.82	0.71
Potassium	meq/100g	0.10	<0.10	<0.10
Magnesium	meq/100g	0.10	0.19	0.31
Sodium	meq/100g	0.10	<0.10	<0.10
Cation Exchange Capacity (CEC)	meq/100g	0.10	1.1	1.1

Inorganics - General Physical Parameters (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02
Your Reference			SB1	SB1
Date Sampled			25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00
pH	pH units		6.2	6.5
Electrical Conductivity	µS/cm	2.0	3.3	4.7

Inorganics - General Chemical Parameters (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02	PEG1691-03
Your Reference			SB1	SB1	Dup
Date Sampled			25/07/2023	25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00	
Fluoride	mg/kg	0.50	<0.50	<0.50	<0.50
Phosphate as P	mg/kg	0.50	<0.50	<0.50	[NA]
Hexavalent Chromium	mg/kg	1.0	<1.0	<1.0	[NA]

Inorganics - Moisture (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02	PEG1691-03	PEG1691-04
Your Reference			SB1	SB1	Dup	Trip Blank
Date Sampled			25/07/2023	25/07/2023	25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00		
Moisture	%	0.10	1.6	2.6	1.3	<0.10

Inorganics - Carbons, Nitrogen Species, Sulfur Species (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02
Your Reference			SB1	SB1
Date Sampled			25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00
Organic Carbon (Walkley Black)	mg/kg	1000	2900	1800
Total Organic Carbon (Walkley Black)	mg/kg	1000	3800	2500
Total Organic Matter (Walkley Black)	mg/kg	1000	6600	4200
Ammonia as N	mg/kg	0.50	1.4	1.1
Nitrate as N	mg/kg	0.50	<0.50	<0.50
Nitrate as NO3 by calculation	mg/kg	3.0	<3.0	<3.0
Nitrite as N	mg/kg	0.50	<0.50	<0.50
Nitrite as NO2 by calculation*	mg/kg	2.0	<2.0	<2.0
NOx as N	mg/kg	0.50	<0.50	<0.50
TKN as N	mg/kg	10	100	96
Organic Nitrogen by calc	mg/kg	10	100	95
Total Nitrogen as N by calculation	mg/kg	10	100	96

Inorganics - Cyanide Species and Similar (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02
Your Reference			SB1	SB1
Date Sampled			25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00
Total Cyanide	mg/kg	0.50	<0.50	<0.50

Inorganics - Miscellaneous (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02
Your Reference			SB1	SB1
Date Sampled			25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00
2 µm Clay	% passing	1.0	1.0	7.0

Inorganics - Miscellaneous (Soil) - Analysed By Envirolab Services Sydney

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02
Your Reference			SB1	SB1
Date Sampled			25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00
Particle Density*	g/cm3		2.6	2.6

Inorganics (CaCl2 extraction) (Soil)

Envirolab ID	Units	PQL	PEG1691-01	PEG1691-02
Your Reference			SB1	SB1
Date Sampled			25/07/2023	25/07/2023
Depth			0.00-0.30	1.70-2.00
pH (1:5 soil:CaCl2)	pH units		4.9	5.7

Method Summary

Method ID	Methodology Summary
Calc	Calculation
INORG-001	pH - Measured using pH meter and electrode based on APHA latest edition, Method 4500-H+. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the APHA recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-001_CACL2	pH - Measured using pH meter and electrode based on APHA latest edition, Method 4500-H+. Solids are reported from a 1:5 extract using 0.01M calcium chloride.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C based on APHA latest edition Method 2510. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
INORG-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms.
INORG-026	Fluoride determined by ion selective electrode (ISE) based on APHA latest edition, 4500-F-C. Solids are reported from a 1:5 water extract unless otherwise specified.
INORG-036	Total Organic Carbon and/or Matter - A titrimetric method that measures the oxidisable organic content of soils.
INORG-055	Nitrate/Nitrite/NOx/TKN - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils/solids are analysed following a water extraction.
INORG-057	Ammonia - determined colourimetrically. Water samples are filtered on receipt prior to analysis. Soils and OHS media are analysed following a water extraction. Alternatively, Ammonia can be extracted from soil using 1M KCl.
INORG-060	Phosphate - determined colourimetrically using APHA latest edition 4500 P E. Water samples are filtered on receipt prior to analysis. Soils are analysed from a water extract.
INORG-062	TKN - determined colourimetrically. Alternatively, TKN can be derived from calculation (Total N - NOx).
INORG-107	Particle Size Distribution using in house method INORG-107 (sieves and hydrometer).
INORG-118	Hexavalent Chromium by Ion Chromatographic separation and colourimetric determination. Waters samples are filtered prior to analysis. Solids are extracted with an alkaline buffered solution, for air sampling media the same alkali extraction can be used or alternatives from NIOSH/OSHA. For aqueous samples, Total Hexavalent Chromium includes the dissolved Hexavalent Chromium and any Hexavalent Chromium solubilised by the preservative i.e. Sodium Hydroxide from any particulate that may be present.
INORG-122	Soil Density using gas pycnometer
METALS-020	Determination of various metals by ICP-OES.
METALS-020_008A	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.
METALS-021	Determination of Mercury by Cold Vapour AAS.
METALS-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.
ORG-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
ORG-023_F1_TOT	Determination of volatile organic compounds (VOCs) by P&T-GC-MS. Water samples are analysed directly by purge and trap GC-MS. Solids are extracted with Methanol, diluted and analysed by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from the latest "Australian Drinking Water Guidelines", published by NHMRC. No guideline values have been set for Total Coliforms in drinking water. Increased concentrations should be investigated. Total Coliforms are not considered useful as indicators of the presence of faecal contamination.

Where we have provided guideline values eg. ADWG Health Value, it is the responsiblity of the reader to decide if the water is fit for consumption. Please note that the tests we have conducted are just a selection of common tests to give you a general idea of drinking water quality. There are many other tests included in the ADWG that we have not tested for.

Data Quality Assessment Summary PEG1691

Client Details

Client	Gemec
Your Reference	BME - Valhalla - Valhalla Proposed Well 3
Date Issued	04/08/2023

Recommended Holding Time Compliance

Recommended holding time exceedances exist - See detailed list below

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	No	Matrix Spike Outliers Exist - See detailed list below
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEG1691

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
vTRH&MBTEXN | Soil	1-4	25/07/2023	03/08/2023	03/08/2023	Yes
sTRH | Soil	1-3	25/07/2023	03/08/2023	04/08/2023	Yes
Metals | Soil	1-3	25/07/2023	03/08/2023	03/08/2023	Yes
Metals-Hg | Soil	1-3	25/07/2023	03/08/2023	04/08/2023	Yes
Total Metals | Water	5	25/07/2023	01/08/2023	03/08/2023	Yes
Metals (LL) | Soil	1-3	25/07/2023	03/08/2023	03/08/2023	Yes
Total Metals (LL) | Water	5	25/07/2023	01/08/2023	03/08/2023	Yes
CEC | Soil	1-2	25/07/2023	03/08/2023	03/08/2023	Yes
Exchangeable Cations | Soil	1-2	25/07/2023	03/08/2023	03/08/2023	Yes
EC | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	No
pH | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	No
Cr6+ | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	Yes
Fluoride | Soil	1-3	25/07/2023	03/08/2023	04/08/2023	Yes
Phosphate as P | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	No
Moisture | Soil	1-4	25/07/2023	03/08/2023	04/08/2023	Yes
Nitrogen - Ammonia | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	Yes
Nitrogen - Nitrate | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	Yes
Nitrogen - Nitrite | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	No
Nitrogen - NOx | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	No
Nitrogen - TKN | Soil	1-2	25/07/2023	27/07/2023	01/08/2023	Yes
OC Walkley Black | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	Yes
TOC Walkley Black | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	Yes
TOM Walkley Black | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	Yes
Cyanide - Total | Soil	1-2	25/07/2023	03/08/2023	03/08/2023	Yes
Clay Content | Soil	1-2	25/07/2023	04/08/2023	04/08/2023	Yes
Particle Density | Soil	1-2	25/07/2023	02/08/2023	02/08/2023	Yes
pH CaCl2 | Soil	1-2	25/07/2023	03/08/2023	04/08/2023	No

Data Quality Assessment Summary PEG1691

Outliers: Matrix Spike

INORG-062|Inorganics - Carbons, Nitrogen Species, Sulfur Species (Soil)| Batch BEG2895

Sample ID	Analyte	% Limits	% Recovery
BEG2895-MS1#	TKN as N	70 - 130	##[1]

METALS-020|Acid Extractable Metals (Water)| Batch BEH0094

Sample ID	Analyte	% Limits	% Recovery
BEH0094-MS1#	Sulfur	70 - 130	##[1]

METALS-020|Acid Extractable Metals (Soil)| Batch BEH0291

Sample ID	Analyte	% Limits	% Recovery
PEG1691-02	Aluminium	70 - 130	##[1]
PEG1691-02	Iron	70 - 130	##[1]

METALS-022|Acid Extractable Low Level Metals (Water)| Batch BEH0093

Sample ID	Analyte	% Limits	% Recovery
BEH0093-MS1#	Aluminium	70 - 130	##[1]
BEH0093-MS1#	Manganese	70 - 130	##[1]
BEH0093-MS1#	Zinc	70 - 130	##[1]

Quality Control PEG1691

ORG-023_F1_TOT|Volatile TRH and BTEX (Soil) | Batch BEH0292

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	DUP2 BEH0292-DUP2# Samp | QC | RPD %	LCS %	Spike % PEG1691-02
TRH C6-C9	mg/kg	25	<25	<25 | <25 | [NA]	<25 | <25 | [NA]	107	115
TRH C6-C10	mg/kg	25	<25	<25 | <25 | [NA]	<25 | <25 | [NA]	107	114
TRH C6-C10 less BTEX (F1)	mg/kg	25	<25	<25 | <25 | [NA]	<25 | <25 | [NA]	[NA]	[NA]
Methyl tert butyl ether (MTBE)	mg/kg	0.50	<0.50			[NA]	[NA]
Benzene	mg/kg	0.20	<0.20	<0.20 | <0.20 | [NA]	<0.20 | <0.20 | [NA]	106	112
Toluene	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	<0.50 | <0.50 | [NA]	95.6	103
Ethylbenzene	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	<1.0 | <1.0 | [NA]	99.2	106
meta+para Xylene	mg/kg	2.0	<2.0	<2.0 | <2.0 | [NA]	<2.0 | <2.0 | [NA]	89.1	95.6
ortho-Xylene	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	<1.0 | <1.0 | [NA]	97.0	103
Total Xylene	mg/kg	3.0	<3.0	<3.0 | <3.0 | [NA]	<3.0 | <3.0 | [NA]	[NA]	[NA]
Naphthalene (value used in F2 calc)	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	<1.0 | <1.0 | [NA]	[NA]	[NA]
Surrogate aaa-Trifluorotoluene	*%*		*95.9*	*90.3 / 93.3*	*87.2 / 84.4*	*93.6*	*94.8*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

ORG-020|Semi-volatile TRH (Soil) | Batch BEH0294

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	DUP2 BEH0294-DUP2# Samp | QC | RPD %	LCS %	Spike % PEG1691-02
TRH C10-C14	mg/kg	50	<50	<50 | <50 | [NA]	<50 | <50 | [NA]	88.9	92.6
TRH C15-C28	mg/kg	100	<100	<100 | <100 | [NA]	<100 | <100 | [NA]	89.2	94.7
TRH C29-C36	mg/kg	100	<100	<100 | <100 | [NA]	<100 | <100 | [NA]	88.6	92.9
TRH >C10-C16	mg/kg	50	<50	<50 | <50 | [NA]	<50 | <50 | [NA] [2]	90.1	94.1
TRH >C16-C34 (F3)	mg/kg	100	<100	<100 | <100 | [NA]	<100 | <100 | [NA]	78.7	83.8
TRH >C34-C40 (F4)	mg/kg	100	<100	<100 | <100 | [NA]	<100 | <100 | [NA] [2]	89.6	94.0
Surrogate o-Terphenyl	*%*		*95.2*	*101 / 100*	*102 / 102*	*101*	*104*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

METALS-020|Acid Extractable Metals (Soil) | Batch BEH0291

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	DUP2 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Aluminium	mg/kg	10	<10	2040 | 1960 | 3.94	2040 | 1910 | 6.56	103	##[1]
Arsenic	mg/kg	4.0	<4.0	<4.0 | <4.0 | [NA]	<4.0 | <4.0 | [NA]	107	106
Barium	mg/kg	1.0	<1.0	14.3 | 14.3 | 0.00883	14.3 | 13.6 | 4.50	111	112
Boron	mg/kg	10	<10	<10 | <10 | [NA]	<10 | <10 | [NA]	98.3	94.0
Cadmium	mg/kg	0.40	<0.40	<0.40 | <0.40 | [NA]	<0.40 | <0.40 | [NA]	108	104
Chromium	mg/kg	1.0	<1.0	16.7 | 17.5 | 4.75	16.7 | 16.6 | 0.672	105	105
Copper	mg/kg	1.0	<1.0	1.36 | 1.33 | 2.39	1.36 | 1.24 | 9.70	104	103
Iron	mg/kg	10	<10	5880 | 5610 | 4.61	5880 | 5690 | 3.26	108	##[1]
Lead	mg/kg	1.0	<1.0	2.98 | 3.02 | 1.39	2.98 | 2.96 | 0.682	105	101
Manganese	mg/kg	1.0	<1.0	69.0 | 68.9 | 0.108	69.0 | 68.1 | 1.20	106	104
Mercury	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]	<0.10 | <0.10 | [NA]	91.2	97.2
Nickel	mg/kg	1.0	<1.0	1.76 | 1.70 | 3.70	1.76 | 1.64 | 7.00	103	102
Phosphorus	mg/kg	10	<10	24.0 | 23.5 | 2.05	24.0 | 23.3 | 2.69	104	104
Selenium	mg/kg	2.0	<2.0	<2.0 | <2.0 | [NA]	<2.0 | <2.0 | [NA]	105	99.2
Strontium	mg/kg	1.0	<1.0	2.14 | 2.15 | 0.286	2.14 | 2.09 | 2.53	103	106
Sulfur	mg/kg	10	<10	<10 | <10 | [NA]	<10 | <10 | [NA]	103	102
Tin	mg/kg	2.0	<2.0	<2.0 | <2.0 | [NA]	<2.0 | <2.0 | [NA]	104	99.1
Zinc	mg/kg	1.0	<1.0	1.59 | 1.42 | 11.1	1.59 | 1.35 | 16.6	107	102

Quality Control PEG1691

METALS-020|Acid Extractable Metals (Water) | Batch BEH0094

Analyte	Units	PQL	Blank	DUP1 BEH0094-DUP1# Samp | QC | RPD %	LCS %	Spike % BEH0094-MS1#
Sulfur	mg/L	0.50	<0.50	35.2 | 33.9 | 3.88	104	##[1]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

METALS-022|Acid Extractable Low Level Metals (Soil) | Batch BEH0291

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	DUP2 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Thorium	mg/kg	0.50	<0.50	1.70 | 1.73 | 1.29	1.70 | 1.69 | 0.954	103	105
Uranium	mg/kg	0.10	<0.10	0.171 | 0.164 | 4.41	0.171 | 0.164 | 3.92	103	104

METALS-022|Acid Extractable Low Level Metals (Water) | Batch BEH0093

Analyte	Units	PQL	Blank	DUP1 BEH0093-DUP1# Samp | QC | RPD %	DUP2 BEH0093-DUP2# Samp | QC | RPD %	LCS %	Spike % BEH0093-MS1#
Aluminium	µg/L	10	<10	<10 | <10 | [NA]	327 | 338 | 3.22	90.3	##[1]
Chromium	µg/L	1.0	<1.0	<1.0 | <1.0 | [NA]	<10 | <10 | [NA]	97.8	112
Copper	µg/L	1.0	<1.0		85.3 | 83.1 | 2.61	100	98.8
Iron	µg/L	10	<10	<10 | <10 | [NA]	972 | 939 | 3.40	109	81.8
Lead	µg/L	1.0	<1.0	<1.0 | <1.0 | [NA]	<10 | <10 | [NA]	98.3	105
Manganese	µg/L	1.0	<1.0	<1.0 | <1.0 | [NA]	7690 | 7760 | 0.930	88.0	##[1]
Zinc	µg/L	1.0	<1.0	<1.0 | <1.0 | [NA]	77.3 | 87.5 | 12.4	96.3	##[1]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

METALS-020_008A|Exchangeable Cations (Soil) | Batch BEH0258

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Calcium	meq/100g	0.10	<0.10	0.820 | 0.760 | 7.59	105	105
Potassium	meq/100g	0.10	<0.10	<0.10 | <0.10 | [NA]	96.3	96.3
Magnesium	meq/100g	0.10	<0.10	0.190 | 0.170 | 11.1	97.6	97.7
Sodium	meq/100g	0.10	<0.10	<0.10 | <0.10 | [NA]	83.4	84.1
Cation Exchange Capacity (CEC)	meq/100g	0.10	<0.10		[NA]	[NA]

INORG-001|Inorganics - General Physical Parameters (Soil) | Batch BEH0320

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %
pH	pH units		5.6	6.2 | 6.1 | 0.814	101
Electrical Conductivity	µS/cm	2.0	<2.0	3.30 | 4.40 | 28.6	101

INORG-118|Inorganics - General Chemical Parameters (Soil) | Batch BEH0289

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Hexavalent Chromium	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	105	109

INORG-026|Inorganics - General Chemical Parameters (Soil) | Batch BEH0319

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Fluoride	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	114	106

Quality Control PEG1691

INORG-060 | Inorganics - General Chemical Parameters (Soil) | Batch BEH0323

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Phosphate as P	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	104	105

INORG-008 | Inorganics - Moisture (Soil) | Batch BEH0284

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	DUP2 BEH0284-DUP2# Samp | QC | RPD %	LCS %
Moisture	%	0.1		1.56 | 1.50 | 3.92	24.4 | 24.0 | 1.69	[NA]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-062 | Inorganics - Carbons, Nitrogen Species, Sulfur Species (Soil) | Batch BEG2895

Analyte	Units	PQL	Blank	DUP1 BEG2895-DUP1# Samp | QC | RPD %	LCS %	Spike % BEG2895-MS1#
TKN as N	mg/kg	10	<10	652 | 613 | 6.13	87.9	##[1]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-036 | Inorganics - Carbons, Nitrogen Species, Sulfur Species (Soil) | Batch BEH0322

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %
Organic Carbon (Walkley Black)	mg/kg	1000	<1000	2880 | 2960 | 2.54	102
Total Organic Carbon (Walkley Black)	mg/kg	1000	<1000	3840 | 3940 | 2.52	102
Total Organic Matter (Walkley Black)	mg/kg	1000	<1000	6620 | 6790 | 2.52	102

INORG-055 | Inorganics - Carbons, Nitrogen Species, Sulfur Species (Soil) | Batch BEH0323

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Nitrate as N	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	97.7	98.9
Nitrate as NO3 by calculation	mg/kg	3.0	<3.0		[NA]	[NA]
Nitrite as N	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Nitrite as NO2 by calculation	mg/kg	2.0	<2.0		[NA]	[NA]
NOx as N	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	97.7	98.9

INORG-057 | Inorganics - Carbons, Nitrogen Species, Sulfur Species (Soil) | Batch BEH0324

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Ammonia as N	mg/kg	0.50	<0.50	1.37 | 1.39 | 1.99	97.1	85.5

INORG-014 | Inorganics - Cyanide Species and Similar (Soil) | Batch BEH0290

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %	Spike % PEG1691-02
Total Cyanide	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	111	113

INORG-001_CACL2 | Inorganics (CaCl2 extraction) (Soil) | Batch BEH0321

Analyte	Units	PQL	Blank	DUP1 PEG1691-01 Samp | QC | RPD %	LCS %
pH (1:5 soil:CaCl2)	pH units			4.9 | 4.9 | 0.00	101

Quality Control PEG1691

QC Comments

Identifier	Description
[1]	Spike recovery is not applicable due to the relatively high analyte background in the sample (>3* spike level). However, the LCS recovery is within acceptance criteria.
[2]	Duplicate %RPD may be flagged as an outlier to routine laboratory acceptance, however, where one or both results are <10*PQL, the RPD acceptance criteria increases exponentially.

CHAIN OF CUSTODY - Client

Client: Gemec
Project Mgr: Nicolo Jelovsek
Sampler: Nicolo Jelovsek
Address: 1/25 Foss St Palmyra 6157
Email: nicolo@gemec.com.au
Phone: 08 9339 8449 / 0439 093 980

gemec ENVIRONMENTAL CONSULTANTS

Client Project Name and Number: BME - Valhalla
Location: Valhalla Proposed Well 3
MPL Quote No: 22PE483
Date results required:
Or choose: standard ~~/ 1 day / 2 day / 3 day~~
Note: Inform lab in advance if urgent turnaround is required - surcharge applies

MPL Laboratories
Address: 16-18 Hayden Crt
Myaree 6154
Phone: 08 9317 2505
Fax: 08 9317 4163
E-mail: lab@mpl.com.au

mpl Laboratories

Sample information

Analyses Required

MPL Sample ID	Client Sample ID	Depth (m)	Date sampled	Time	Type of sample	CS001_M: BTEXN, TRH, 8 metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	Extra metals: Al, Ba, B, Fe, Mn, S, Se, Sn, Sr, Th,	Hexavalent chromium	Cyanide (total)	Fluoride	E010302: Nutrient suite	pH & EC	vTRH (C6-C9) + BTEXN	8 metals: Al Cu Cr Fe Pb Mn S Zn (total) - excl.	SS350: NEPM2013 Soil Characteristics EIL			
(1)	Split	-	25.07.23	-	Soil	X	X			X								

Comments

Email CoC with report also please
Sample containers labelled VDE
Please send Split sample to Envirolab Sydney

12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 329380
Date Received: 1/8/23
Time Received: 1325
Received by:
Temp: Cool / ambient 11°C
Cooling: Ice/Icepack
Security: Intact / Broken/None

Relinquished by (company): Gemec	**Received by (company):** MPL	EBS_Syd.
Print Name: Nicolo Jelovsek	**Print Name:** CTadura	1/8/23
Date & Time: 28.07.23, 10:00	**Date & Time:** 28 JUL 2023 @ 1135	1325
Signature:	**Signature:**	JC

Laboratory Use Only:
Samples Received: Cool / ambient
Temperature Received at: 8 (if applicable)
Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Gemec
Attention	Nicolo Jelovsek

Sample Login Details

Your reference	BME- Valhalla
Envirolab Reference	329380
Date Sample Received	01/08/2023
Date Instructions Received	01/08/2023
Date Results Expected to be Reported	08/08/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	11
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	Acid Extractable metalsin soil	Misc Inorg - Soil
Split	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 329380

Client Details

Client	Gemec
Attention	Nicolo Jelovsek
Address	1/25 Foss St, Palmyra, WA, 6157

Sample Details

Your Reference	**BME- Valhalla**
Number of Samples	1 Soil
Date samples received	01/08/2023
Date completed instructions received	01/08/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	08/08/2023
Date of Issue	08/08/2023

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Loren Bardwell, Development Chemist
Steven Luong, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		329380-1
Your Reference	UNITS	Split
Date Sampled		25/07/2023
Type of sample		Soil
Date extracted	-	02/08/2023
Date analysed	-	04/08/2023
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
Naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	89

svTRH (C10-C40) in Soil		
Our Reference	UNITS	329380-1
Your Reference		Split
Date Sampled		25/07/2023
Type of sample		Soil
Date extracted	-	02/08/2023
Date analysed	-	05/08/2023
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
Total +ve TRH (C10-C36)	mg/kg	<50
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	89

Acid Extractable metals in soil		
Our Reference		329380-1
Your Reference	UNITS	Split
Date Sampled		25/07/2023
Type of sample		Soil
Date prepared	-	08/08/2023
Date analysed	-	08/08/2023
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	15
Copper	mg/kg	2
Lead	mg/kg	2
Mercury	mg/kg	<0.1
Nickel	mg/kg	2
Zinc	mg/kg	1
Aluminium	mg/kg	1,400
Barium	mg/kg	13
Boron	mg/kg	<10
Iron	mg/kg	5,400
Manganese	mg/kg	69
Sulphur	mg/kg	10
Selenium	mg/kg	<2
Tin	mg/kg	<2
Strontium	mg/kg	2
Thorium*	mg/kg	1

Misc Inorg - Soil		
Our Reference		329380-1
Your Reference	UNITS	Split
Date Sampled		25/07/2023
Type of sample		Soil
Date prepared	-	03/08/2023
Date analysed	-	03/08/2023
Fluoride (1:5 soil:water)	mg/kg	1.0

Moisture		
Our Reference		329380-1
Your Reference	UNITS	Split
Date Sampled		25/07/2023
Type of sample		Soil
Date prepared	-	02/08/2023
Date analysed	-	03/08/2023
Moisture	%	0.9

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date extracted	-			02/08/2023	[NT]	[NT]	[NT]	[NT]	02/08/2023	[NT]
Date analysed	-			04/08/2023	[NT]	[NT]	[NT]	[NT]	04/08/2023	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	119	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	119	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	[NT]	[NT]	[NT]	[NT]	110	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	114	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	132	[NT]
o-Xylene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	123	[NT]
Naphthalene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	84	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			02/08/2023	[NT]	[NT]	[NT]	[NT]	02/08/2023	[NT]
Date analysed	-			05/08/2023	[NT]	[NT]	[NT]	[NT]	05/08/2023	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	123	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	126	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	123	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	126	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	114	[NT]
Surrogate o-Terphenyl	%		Org-020	94	[NT]	[NT]	[NT]	[NT]	106	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			08/08/2023	[NT]	[NT]	[NT]	[NT]	08/08/2023	[NT]
Date analysed	-			08/08/2023	[NT]	[NT]	[NT]	[NT]	08/08/2023	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	103	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	95	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Aluminium	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	104	[NT]
Barium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Boron	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	102	[NT]
Iron	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	102	[NT]
Manganese	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Sulphur	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
Selenium	mg/kg	2	Metals-020	<2	[NT]	[NT]	[NT]	[NT]	100	[NT]
Tin	mg/kg	2	Metals-020	<2	[NT]	[NT]	[NT]	[NT]	96	[NT]
Strontium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Thorium*	mg/kg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			03/08/2023	[NT]	[NT]	[NT]	[NT]	03/08/2023	[NT]
Date analysed	-			03/08/2023	[NT]	[NT]	[NT]	[NT]	03/08/2023	[NT]
Fluoride (1:5 soil:water)	mg/kg	0.5	Inorg-026	<0.5	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Appendix B – Supporting Data

Soil Bore Log

GEMEC BORE LOG

CLIENT: Black Mountain Energy
CONSULTANT: Gemec
PROJECT: Valhalla
LOCATION: Proposed Well 3
DRILL DATE: 25.07.23

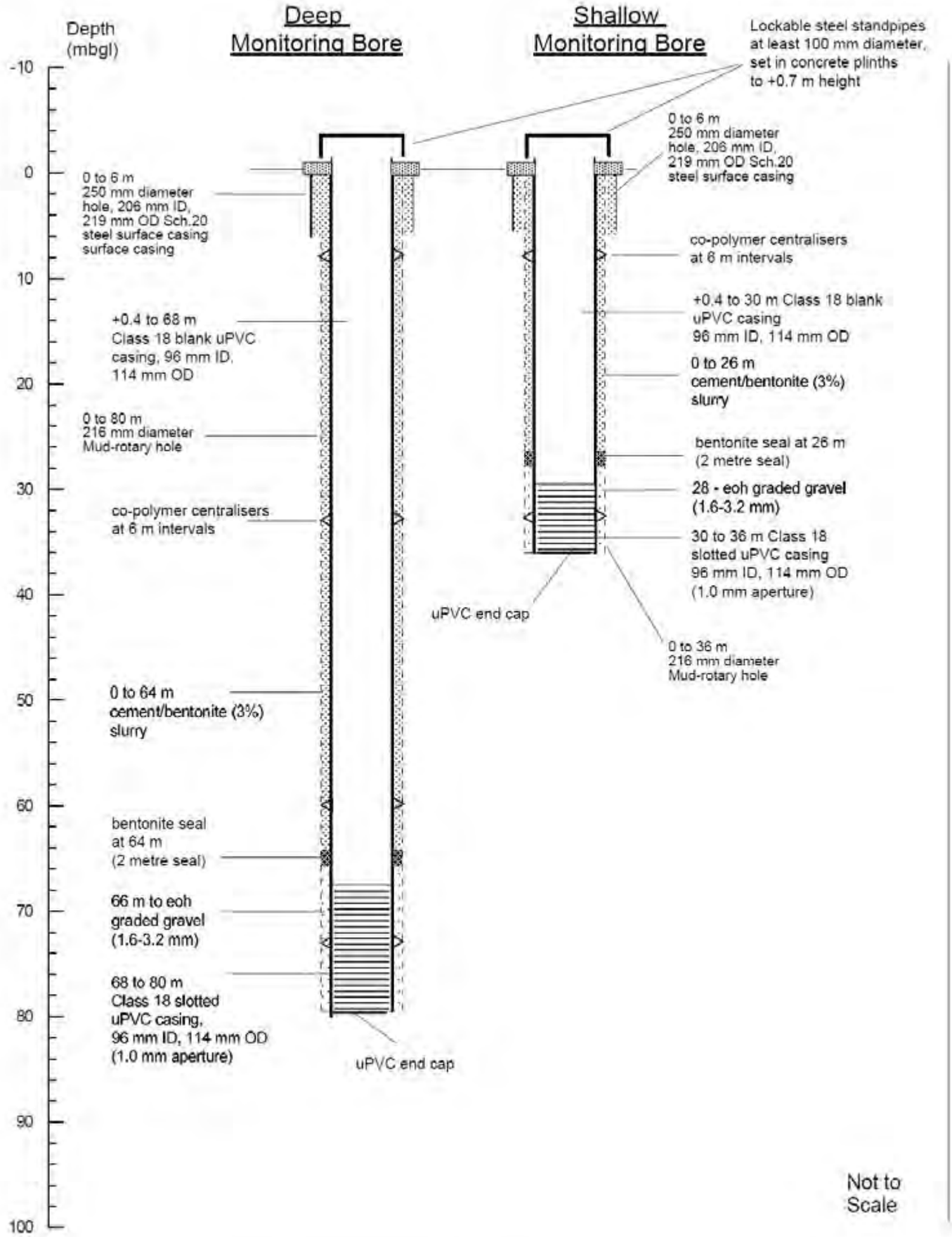
SOIL BOREHOLE NO: SB1
BOREHOLE Ø: 75 mm
EASTING: 708780 m E
NORTHING: 7978129 m N (MGA2020, Zone 51)
DRILL RIG: NA
DRILL METHOD: Hand Auger
DRILLING CO: NA

DEPTH (m bgs)	WELL MATERIALS	LITHOLOGY	DESCRIPTION	ODOUR	PID (ppmv)	SAMPLE (X)	OBSERVATIONS
			Ground Surface				
0.0			**SILTY CLAYEY SAND** Brown, fine grain, dry to slightly damp.				
			SILTY CLAYEY SAND Brown/red, damp.	NO	0.0	X	
							No odours or staining noted
1.0				NO			
2.0				NO	0.0	X	EOH @ 2.0 m bgs

NOTES: **NO / WO / DO / SO / VSO = No / weak / distinct / strong / very strong (odour);**
m BGS = metres below ground surface; AGS = above ground surface; EoH = end of hole;
NR = no response.

Buru Energy Monitoring Bore Conceptual Design

Drawing No.2



Not to Scale

MB Concep Design Valhalla-Asgard grf

Client : Buru Energy Ltd	MONITORING BORES CONCEPTUAL DESIGN
Project : Groundwater Monitoring	VALHALLA - ASGARD AREA
Date : May 2013	
Dwg No. : 416-0/13/2-2	Rockwater Pty Ltd

Field Equipment Calibration Certificates

AES
sensing safety

Calibration and Service Report – PID

Company:	GEMEC	**Manufacturer:**	Ion Science	**Serial #:**	T-105368
Contact:	Dan Baldwin	**Instrument:**	PHOCHECK TIGER SN: T-105	**Asset #:**	
Address:	PO Box 89 Melville WA 6956	**Model:**	TIGER	**Part #:**	
		Configuration:	VOC	**Sold:**	19.04.2023
		Wireless:		**Last Cal:**	
Phone:	0893398449	**Network ID:**		**Job #:**	149372
Fax:		**Unit ID:**		**Cal Spec:**	
Email:	dan@gemec.com.au	**Details:**		**Order #:**	CREDIT CARD

Calibration Certificate

Sensor	Type	Serial No.	Span Gas	Concentration	Traceability Lot #	CF	Reading	
							Zero	Span
Oxygen								
LEL								
PID	PID Sensor		Isobutylene	100 PPM	6481-2-1	1.0	0.0	100.0ppm
Battery								
Toxic 1								
Toxic 2								
Toxic 3								
Toxic 4								
Toxic 5								
Toxic 6								

Calibrated/Repaired by: SURESH KUMAR Date: 19.04.2023 Next Due: 19.10.2023

AES
sensing safety

Calibration and Service Report – PID

Company:	GEMEC	**Manufacturer:**	Ion Science	**Serial #:**	T-105368
Contact:	Dan Baldwin	**Instrument:**	PHOCHECK TIGER SN: T-105	**Asset #:**	
Address:	PO Box 89 Melville WA 6956	**Model:**	TIGER	**Part #:**	
		Configuration:	VOC	**Sold:**	19.04.2023
		Wireless:		**Last Cal:**	
Phone:	0893398449	**Network ID:**		**Job #:**	149372
Fax:		**Unit ID:**		**Cal Spec:**	
Email:	dan@gemec.com.au	**Details:**		**Order #:**	CREDIT CARD

Item	Test	Pass/Fail	Comments	Serial Number
Battery	NiCd, NiMH, Dry cell, LiIon	P		
Charger	Power Supply	P		
	Cradle, Travel Charger	P		
Pump	Flow	P	>100 mL/min	
Filter	Filter, fitting, etc	X	Replaced	
Alarms	Audible, visual, vibration	P		
Display	Operation	P		
Switches	Operation	P		
PCB	Operation	P		
Connectors	Condition	P		
Firmware	Version	P	V 0.8.14	
Datalogger	Operation	P		
Monitor Housing	Condition	P		
Case	Condition / Type	P	Cleaned	
Sensors				
PID	Lamp	P		
PID	Sensor	P		
THP	Sensor	P		

Engineer's Report

Boot is cleaned. Date and time is updated.
Pump flow is at 157ml/min.
Inspected and calibrated, pass.

Field Data Sheets

Soil Sample Register

gemec

Project:	VALHALLA					Sampler:	N5	Date:	25·7·23
Sample ID	Depth (m BGS)	Time	PID (ppm$_v$)	Dup / Split	Wall / Base	Sample Description		Contamination Observations	
S81	0-0.3	:	0.0	✓		Silty, clayey sand, f-gr, dry/sl. damp Brn.		—	
		:							
	1.7-	:							
	2.0	:	0.0			" , brn. red, damp, sl. damp from 0.7m		—	
		:							
		:							
		:					

HSL Application Checklist

HSL APPLICATION CHECKLIST

INTRODUCTION

This checklist is designed to allow assessors to conceptualise potential issues with contaminated land, and how to apply the HSLs. The checklist is designed to trigger responses from the assessor in determining whether the HSLs are applicable or whether consideration should be given to a more site-specific determination of risk. It highlights the key limitations and considerations that are common to contamination assessments and risk assessment.

The checklist summarises the key items from this Application Document.
It is recommended that the Application Document be read in conjunction with the use of this Checklist.

Summary of Steps

Step 1	**Identification of key limitations to the application of health screening levels**
Step 2	**Identification of key receptors and scenarios**
Step 3	**Identification of relevant soil type**
Step 4	**Identification of impacted media and depths**
Step 5	**Identification of source concentrations to be compared with health screening levels**
Step 6	**Selecting appropriate HSL and consideration of combining vapour intrusion and direct contact exposure**
Step 7	**Applying adjustments to the HSLs based on vapour biodegradation, soil organic carbon content, air exchange rate, and soil moisture content Consideration given to soil saturation and water solubility limits**
Step 8	**Adjustments for cancer risk assessment - modification of acceptable cancer risk level, assessment of cumulative cancer risk**

Step 1 – Limitations to HSLs			Comments
Assessing contamination in soil and groundwater should only be carried out by a qualified professional.			
Are guidelines relevant for site? Check the following limitations:			
Have chemicals other than petroleum hydrocarbons been identified at the site? →	NA	May consider site-specific risk asessment (refer to Section 5.2 of the Application Document)	No impact - baseline assessment
Is the groundwater to be used for irrigation purposes? →	N	May consider site-specific risk asessment (refer to Section 2.4.5 of the Application Document)	
Is the site conservation land? →	N	May be required to also assess ecological values (refer to Section 2.4.6 of the Application Document)	
Is the depth to groundwater impact less than 2m bgs ? →	NA	May consider site-specific risk asessment for direct contact May consider soil vapour sampling for vapour intrusion (refer to Section 2.4.2 of the Application Document)	No impact - baseline assessment
Has significant odour been observed at the site? →	N	May be required to also assess odour for sensitive land uses (refer to Section 5.4 of the Application Document)	
Is the identified chemical a result of a solvent spill rather than petroleum spill/leak? →	NA	HSLs may be used where saturation point is not considered (refer to Section 5.3 of the Application Document)	No impact - baseline assessment
Is the identified contamination an atypical petroleum mixture? →	NA	May consider site-specific risk asessment to consider cumulative effects between chemicals (refer to Section 3.6 of the Application Document)	No impact - baseline assessment
Is the soil source thickness significantly different than 2 m? →	NA	For small source thicknesses, HSLs may be overly conservative if source fully depletes. For larger thicknesses HSLs may not adequately characterise risk, however lateral extent of contamination should also be considered. A site-specific HRA may be considered. (refer to Section 2.4.7 of the Application Document)	No impact - baseline assessment
Does the building have a crawl space rather than slab-on-ground construction? →	NA	HSLs may be used as likely to be conservative. However, for situations where habitants may be exposed in crawl space area such as spaces under dwellings which incorporate garages/workshop then consideration may be given to ambient air sampling. (refer to Section 2.3.4 of the Application Document)	No slab-on-ground structures
Does the building have or is likely to have a habitable basement? →	NA	May consider site-specific risk asessment (refer to Section 2.3.3 of the Application Document)	

Note that the HSLs may be used for assessing health risk. In addition to this assessment, legislation requirements still need to be fulfilled which may include other considerations and assessments. Such considerations may include:

- Assessment of environmental values and ecological impacts
- Consideration of sustainability issues
- Risks for extraction and use of groundwater
- Soil source ongoing source to groundwater contamination
- Local planning requirements, such as sensitive uses under commercial zones, or future land use zones
- Social impacts and consultation with stakeholders

Step 2 – Identify receptors and scenarios to be considered

Check the receptors and scenarios to be assessed. Note that receptors and scenarios may require consideration of future land use planning and local regulations pertaining to site redevelopment.

	☐	Residential use (refer to Sections 2.1.1 and 2.3.1 of the Application Document)
HSL-A	☐	Low-Density Residential – assumes access to soils with no management controls on site. Assessment may consider surface soils with direct contact, intrusive maintenance worker protection, and consider using surface soil HSL for all soils down to 3 m depth to protect uncontrolled excavation of contamination.
HSL-B	☐	High-Density Residential – assumes limited access to surface soils with management controls on site. Assessment may consider surface soils/dust with limited direct contact. Intrusive maintenance workers may be protected under suitable site management plan.
HSL-A	☐	Medium-Density Residential with grassed open space – assumes access to soils with management controls on site. Assessment may consider surface soils with direct contact and subsurface soils through vapour intrusion. Intrusive maintenance workers may be protected under suitable site management plan.
HSL-B	☐	Medium-Density Residential with permanent paving open space – assumes limited access to soils with management controls on site. Assessment may consider surface soils/dust with limited direct contact. Intrusive maintenance workers may be protected under suitable site management plan.
HSL-A (for VI) *HSL-A or HSL-B (for DC)*	☐	Low- or Medium-Density Residential with single basement garage – for vapour intrusion, low-density residential (HSL-A) may apply due to low air exchange rate for basement garage. HSL depth is displaced by depth of basement. For soil direct contact HSLs, select from above medium density scenarios based on access to soils. Intrusive maintenance workers may be protected under suitable site management plan (refer to Section 2.3.3 of the Application Document).
HSL-D (for VI) *HSL-B (for DC outside footprint)*	☐	Medium- or High-Density Residential with communal basement car park – assumes no access to soils with management controls on site. HSL depth is displaced by depth of basement. Intrusive maintenance workers may be protected under suitable site management plan. Note that areas outside of the basement footprint may be required to be assessed as a building without basement and with limited direct contact with soil. Also, limited exposure time for basement users and therefore HSL for Commercial Worker may be used for vapour intrusion (refer to Section 2.3.3 of the Application Document).
HSL-C	X	Recreational / Public Open Space (refer to Section 2.1.2 of the Application Document)
	☐	Parks, ovals, pedestrian areas
	☐	National parks, conservation areas – may be required to also assess ecological values (refer to Section 2.4.6 of the Application Document)
HSL-D	☐	Commercial / Industrial Workers (refer to Section 2.1.3 of the Application Document) – considers only healthy adults under normal working conditions. Does not consider sensitive commercial uses such as schools, day care centres and medical practices.
	☐	Commercial sensitive users – may consider using residential HSLs or a site-specific HRA (refer to Section 2.4.1 of the Application Document)
	☐	Agricultural land – may consider a site specific HRA (refer to Section 2.4.5 of the Application Document)
	☐	Shallow intrusive workers down to 1 m deep. May require assessment of direct contact for soils surface to <2 m (refer to Sections 2.1.4 and 2.4.3 of the Application document)
	☐	Deep intrusive workers down to >1 m deep, such as sewer. Should be managed with appropriate procedures and work practices for confined spaces (refer to Section 2.4.4 of the Application Document)

Is a site management plan (that includes specific occupational hazard management for works on the site) to be implemented on the site (controlled site)? → **N** May not need to consider health risks to intrusive workers

Step 3 – Identify soil type relevant to site (soils above impacts in soil and/or groundwater)

Comments

Note the following before selecting soil type for use in assessment:

1. The prime parameter that influences the value of the HSL is the air filled porosity and volatility of the specific chemical. The higher the air filled porosity the greater the potential for volatile chemicals to migrate vertically through the soil profile.
2. The selection of a generic soil type requires knowledge of the soil profile across the site.
3. The selection of generic soil types should take into account the predominant characteristics of the soil profile and depth of contamination. The generic soil types assume a uniform profile, which at many, if not all, sites will not be the case. Where the overlying profile is predominantly fine materials (clays) (i.e. > 50% for soil column), these may be considered as the generic soil type. If the profile has a significant proportion of loose/coarse materials (including backfill) (i.e. > 50%), these materials may be considered as the generic soil type.
4. Air filled porosity is affected by moisture content. The wetter the soil, the lower the air filled porosity. Generic soil types have assumed a typical moisture content for the profile typical of average soil conditions occurring at depth. Moisture content will vary greatly by location and season. Moisture content will also vary between sub-categories of soil, e.g. between sand and clayey sand. HSLs may be adjusted based on moisture content. This is done in Step 7.
5. The selection of appropriate soil type is discussed in Section 3.2 of the Application Document.

Is there one dominant soil type on the site (> 50% of soil column)?
Or can a geological setting be conservatively identified (i.e. allowing greater vapour transport)? →

- [X] Y - Proceed
- [ ] N - Consideration may be given to assuming the more conservative soil type, or may be given to a site-specific HRA (refer to Section 4.6 of the Application Document)

Has excavated area(s) been backfilled with more porous materials ? →

- [ ] Y - Consideration should be given to adopting a more porous soil type (refer to Section 3.2 of the Application Document)
- [ ] N - Proceed

Does the site lithology contain rock formations
or soil with large cracks that can form preferential pathways? →

- [X] Y - The derived HSLs do not include lithogies with rock formations. Consideration may be given to using soil-vapour sampling or carrying out a site-specific HRA (refer to Section 4.6 of the Application Document)
- [ ] N - Proceed

Identify HSL soil type relevant to site and assessment (above impacts)

The soil profile properties have been based on a predominant soil texture grouping developed by the US Department of Agriculture. The 12 texture classes have been grouped into 3 groups: sand, silt and clay. The groupings of the classes are based on mean particle size and saturation porosities. Refer to Section 3.2 for further discussion on the soil properties.

HSL soil type selected:

- [ ] **Sand** – Properties selected to be representative of a coarse textured undisturbed soil profile. Consists of texture classes sand, sandy clay.
- [ ] **Silt** – Properties selected to be representative of a coarse textured undisturbed soil profile. Consists of texture classes silt, silty clay.
- [ ] **Clay** – Properties selected to be representative of a fine textured undisturbed soil profile. Consists of texture classes clay.
- [X] **Other** – Including soil with large cracks (preferential pathways) and fractured rock (basalt, sandstone, siltstone, limestone) - refer to Section 4.6 of the Application Document. Soil vapour measurement is preferred to soil or groundwater. Due to fractures and preferential vapour pathways in rock, consideration should be given to overlying weathered soil, or to using HSLs for surface soil in sand.

For soil assessment (texture classification) undertaken in accord with AS 1726 the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit less than 50%, and fine with liquid limit greater than 50% respectively.

Where there is uncertainty, laboratory analysis should be carried out. This may include parameters for detailed particle analysis and exact soil texture sub-class, and saturation porosity.

Step 4 – Impact media		Comments
Are there impacts to media other than soil and groundwater? (e.g surface water, biota, odours etc) Note: aesthetic issues (odours/staining/ecological impacts etc.) to be addressed separately →	NA As well as human health assessment, consideration of other issues such as ecological, aesthetics, etc. may be required.	No impact - baseline assessment
Soils Are there soil impacts remaining on the site? →	NA Y - Proceed NA N - Go to groundwater section	No impact - baseline assessment
Depth to soil impacts. Note if considering basements, depths need to be displaced e.g. a 3 m deep basement means surface to <1 m represents 3 m to <4 m. (refer to Section 2.3.3 of the Application Document) ☐ surface to <1 m ☐ 1 m to <2 m ☐ 2 m to <4 m ☐ 4 m and deeper ☐ Displacement due to basement Distance of displacement (m) _____		
Is the site of interest an uncontrolled site where excavation activities such as construction may result in subsurface soil contaminantion brought to surface in the future? →	☐ Consideration may be given to use of HSLs for direct contact and surface HSLs for vapour intrusion, for deeper soils. A site management plan may be used to address uncontrolled excavation at a site. (refer to Sections 2.3.1, 3.4.1, and 4.7 of the Application Document)	
Groundwater Are there groundwater impacts beneath the site? →	NA Y - Proceed ☐ N - Go to soil vapour section	No impact - baseline assessment
Is the depth to groundwater less than 2 m? →	☐ Y - The HSL values may not adequately address this scenario. A site-specific HRA may be considered. Soil vapour sampling may be used to assess vapour intrusion. (refer to Section 2.3.3 of the Application Document)	
Depth to groundwater impacts. Note if considering basements, depths should be displaced e.g. a 3 m deep basement means surface to 2 m represents 5 m (refer to Sections 2.3.3 of the Application Document). With basements, groundwater HSLs may not adequately characterise risks where the groundwater level is within 2 m of basement foundation. ☐ 2 m to <4 m ☐ 4 m to <8 m ☐ 8 m and deeper ☐ Displacement due to basement Distance of displacement (m) _____		

Step 4 – Impact media (cont.)		Comments
Soil vapour Has soil vapour sampling been used to characterise vapour intrusion at the site? → [ ] Y - Proceed; [X] N - Proceed to Step 5 Depth to soil impacts. Note if considering basements, depths need to be displaced e.g. a 3 m deep basement means surface to <1 m represents 3 m to <4 m. (Refer to Section 2.3.3 of the Application Document.) [ ] surface to <1 m [ ] 1 m to <2 m [ ] 2 m to <4 m [ ] 4 m to <8 m [ ] 8 m and deeper [ ] Displacement due to basement Distance of displacement (m) _____ In using soil vapour sampling, please note the following: 1) It is recommended that soil vapour samples be taken as laterally close to a vapour source as possible (within or above). 2) Any sample taken within 1 m of the open air is subject to high levels of uncertainty due to atmospherical and meteorological effects. This includes the base and wall of excavation pits. 3) For sites subject to redevelopment with residential or commercial buildings, the soil vapour profiles are subject to change due to presence of concrete slabs. Caution is required on the use of soil vapour samples that are not within a soil source and in locations where buildings currently do not exist (refer to Section 1.6 of the Application Document).		

Step 5 – Selection of relevant source concentrations		Comments
Soil concentrations		
1. Is the investigation site likely to be subdivided into smaller lots? → [ ] Y - Statistical analysis using entire data set may not be applicable. Consideration may be given to using the maximums or using a sub-set for statistical analysis (refer to Section 3.4.1 of the Application Document) [X] N - Statistical analysis using entire data set may be applicable		
2. Is the site public open space / recreational land where users are unlikely to be in the same location for extended period? → [X] Y - Statistical analysis using entire data set may not be applicable. Consideration may be given to using the maximums or using a sub-set for statistical analysis (refer to Section 3.4.1 of the Application Document) [ ] N - Statistical analysis using entire data set may be applicable		
<u>If statistical analysis is appropriate consideration should be given to the following methodology (refer to Section 3.4.1 of the Application Document):</u> 1. Samples should be sub-divided into appropriate depth ranges as defined by HSLs (i.e. surface to <1 m, 1 m to <2 m, 2 m to <4 m, 4 m+). Note if considering basement, the appropriate displacement distance should be accounted for. 2. For each depth range, the statistical mean (e.g. 95% UCL arithmetic mean) soil concentration should be calculated for each chemical. One approach is described in the NSW EPA *Contaminated sites: Sampling design guidelines* (1995). The coefficient of variance test described in the document may be used to determine if the distribution is normal or lognormal. Consideration of other statistical methods may be adopted if justified (e.g. distribution does not fit a normal or lognormal distribution). 3. For samples with no detection, it is recommended to use half the detection limit during statistical analysis. 4. If the standard deviation is very large (due to outliers or low number of samples) the statistical mean may be higher than the maximum concentrations. In this case it is recommended to use the maximum. 5. It is recommended to keep note of maximum concentrations as well as statistical mean concentrations. Maximum concentrations may be required to address potential acute exposure issues.		
Groundwater concentrations		
Has floating product been identified in any well? → [NA] Y - Refer to point (a)		
(a) If PSH is identified, dissolved phase is likely to contain chemicals at solubility limits. Proceed with HSL comparison, noting that if there is at least one chemical for which HSLs in groundwater is limiting (i.e. not all chemical HSLs are NL) then presence of PSH may be a potential vapour risk to site users (refer to Section 3.4.2 of the Application Document). Also note that the presence of PSH may trigger other legislative requirements for remediation/monitoring.		
Is the area of interest represented by a single groundwater location or multiple ? → [X] Single - small area of interest such as residential dwelling may be represented by the maximum groundwater concentration if the dwelling location is unknown, otherwise if the building footprint is known, the groundwater well nearest to the point of interest may be used. [ ] Multiple - where exposure may occur over larger areas such as recreational parkland, consideration may be given to averaging the concentrations across the area of interest.		Mostly single wells
In deciding which set of monitoring data is most useful for analysis consideration may also be given to: - Historical results to determine trends in groundwater concentrations (i.e. the likelihood that concentrations may increase) - Upgradient wells and background concentrations - Groundwater flow direction (Refer to Section 3.4.2 of the Application Document.)		

Step 5 – Selection of relevant source concentrations (cont)		Comments
Soil vapour concentrations		
Is the area of interest represented by a single or multiple vapour location? →	NA Single - small area of interest such as residential dwelling may be represented by the maximum soil vapour concentration if the dwelling location is unknown, otherwise if the building footprint is known, the groundwater well nearest to the point of interest may be used. NA Multiple - where exposure may occur over larger areas such as recreational parkland, consideration may be given to averaging the concentrations across the area of interest.	Not applicable - baseline assessment
Are soil vapour samples measured in shallow soil less than 1 m from the surface where there is no existing slab or concrete paving? →	Y - Measurements are subject to influence from weather and atmospheric conditions and may not be considered reliable.	
Are soil vapour samples measured in areas where there is no existing slab or concrete paving, and the site is planned to be redeveloped where a building will exist (residential/commercial/ industrial use)? →	Y - Soil vapour samples not measured within a soil or groundwater source, may not be representative of the soil vapour in the future when a building is located on site. The placement of an impermeable barrier such as a concrete slab can cause build-up of soil vapour within the soil and sub-slab, above levels measured where there is no slab present. Note soil vapour measurements from within soil and groundwater sources are not subject to vapour build-up as the soil vapour is likely to be at its maximum concentration when located within the source.	
Soil vapour measurements may be taken at multiple depths, including within the source zone, above the source zone, and directly under a building foundation. Each of the measurement depths should be considered individually.		
Refer to Sections 3.4.3 and 1.6 of the Application Document.		

Step 6 – HSL determination and combined vapour intrusion and direct contact

		Comments
HSL determination		
HSLs and satuaration/solubility limits are presented in the Appendix B HSL tables. Select the appropriate HSLs for vapour intrusion from tables for: 1) Each selected receptor listed in Step 2 2) Dominant soil texture classification listed in Step 3 3) Source depth listed in Step 4 HSLs may be compared to soil/groundwater/soil vapour source concentrations determined in Step 5. Note for TPH C6 to C10, BTEX should be subtracted from analytical result prior to comparing with HSL		
1. Is the HSL value Not Limiting 'NL'? →	[X] Y - Indicates that vapour reaches saturation point and cannot increase to a point which would result in an unacceptable health risk [ ] N - Continue with Question 2 for groundwater, or proceed to Question 3	
2. Is groundwater HSL not 'NL' and PSH identified in water? →	[NA] Y - May indicate potential vapour risk (refer to Section 3.4.2 of Application Document) [NA] N - Proceed to Question 3	
3. Are comparisons being made against soil HSLs? →	[NA] Y - Proceed to Question 4 [NA] N - Proceed to Question 5	Not applicable - baseline assessment
4. Does direct contact need to be considered as well as vapour intrusion? →	[ ] HSL-A Low-Density Residential - surface soils, and possibly subsurface soils if determined to be relevant (refer to Section 4.7 of Application Document). Proceed to 'Combined pathways exposure' [ ] HSL-B High-Density Residential – surface soils. Proceed to 'Combined pathways exposure' [ ] HSL-C Open Space Recreational – surface soils.Proceed to 'Combined pathways exposure' [ ] HSL-D Commercial / Industrial – surface soils. Proceed to 'Combined pathways exposure' [ ] Intrusive Maintenance Worker – down to 2 m. Proceed to 'Combined pathways exposure' [X] N - Proceed to Question 5	
5. Do cross-scenario exposure need to be considered? (eg. adjacent residential and open space) →	[ ] Y - Proceed to 'Combined pathways exposure' [X] N - Proceed to Step 7	

Combined pathways exposure

Refer to Section 3.3 of the Application Document.
Combined exposures may occur on the same property where indoor vapour intrusion occurs concurrently with outdoor direct contact.
Combined exposure may also occur on adjacent properties, e.g. vapour intrusion on residential property and direct contact on adjacent open space (park).
For the given scenarios/chemicals, list the HSLs.

Where a vapour intrusion HSL is Not Limiting (NL) the chemical / scenario does not need to be considered in the combined pathway exposure.

The combined exposure is assessed as follows:

Multiple exposure pathways: $$\textbf{Cumulative Fraction} = \frac{C_{\text{Under Building}}}{HSL_{\text{Vapour Intrusion}}} + \frac{C_{\text{Outside Building}}}{HSL_{\text{Direct Contact}}}$$ where vapour intrusion can refer to soil, groundwater or soil vapour source

Multiple exposure scenarios: $$\textbf{Cumulative Fraction} = \frac{C_{\text{Land use 1}}}{HSL_{\text{Land use 1}}} + \frac{C_{\text{Land use 2}}}{HSL_{\text{Land use 2}}}$$ where the HSLs may refer to HSLs for vapour intrusion or direct contact

If a given C/HSL fraction is less than 0.1, the contribution of risk may be considered insignificant and the cumulative exposure need not be assessed for this scenario.
Where a cumulative fraction is less than 1 risk is normally acceptable. Where the value exceeds 1 a site-specific assessment should be undertaken, or proceed to Step 7.

Step 7 – HSLs and adjustments (vapour intrusion)		Comments
HSL adjustments (vapour intrusion only) For each adjustment, careful consideration and justification is required. **1. Vapour biodegradation** (refer to Section 4.2 of Application Document) Prior to applying attenuation factor for vapour degradation it is recommended to read the source documentation (Davis et al. 2009). The minimum requirements for allowing attenuation factors for vapour degradation are as follows: 1. Is there evidence of oxygen penetration? → NA Y - Requires measurement of oxygen in soil gas with at least 5% at 1 m depth (refer to Section 4.2.1 of Application Document) NA N - Attenuation factor may not be applicable 2. Is the source depth 2 m or deeper? → NA Y - Continue to Question 3 (refer to Section 4.2.2 of Application Document) NA N - Attenuation factor may not be applicable 3. Does the slab have one side less than 15m length? → NA Y - Degradation factor may apply. Less than 4 m depth, a factor of 10 may apply. 4 m and deeper, a factor of 100 may apply. (refer to Section 4.2.3 of Application Document) NA N - Attenuation factor may not be applicable **2. Soil organic carbon content** (refer to Section 4.3 of Application Document) May be used to adjust soil HSLs only. Soil HSLs were based on fraction organic carbon content of 0.003. HSL may be adjusted if background levels of organic carbon content at the same depth as source is different from baseline. Background sample must not be contaminated with hydrocarbons. If surface soil, background sample in open space may not be appropriate to use if comparing for soil under slab. Adjustment is linear, i.e. doubling the organic carbon will double the HSL. Applies only to soil HSL for vapour intrusion. **3. Air exchange rate** (refer to Section 4.4 of Application Document) HSLs are based on air exchange rate (AER) of 0.6 h^{-1} for residential and 0.83 h^{-1} for commercial. Careful justification may be required prior to changing AER. Consideration should be given to weather conditions, practice of leaving doors/windows open, or closed in climate controlled building. New buildings tend to be more air tight to comply with energy saving regulations. For soil and groundwater, adjustment is linear with respect to AER. For soil vapour, adjustment is variable depending on soil type and depth. Refer to the charts in Appendix D to determine the adjustment factor. **4. Moisture content** (refer to Section 4.5 of Application Document) HSLs may be adjusted if moisture content in soil is significantly different from baseline HSLs. The baseline moisture contents used were (dry wt) for sand 8%, silt 22% and clay 20%. Moisture content should be representative of long-term moisture content and not short-term result from recent rain event. Also note that for a development with future building where no building currently exists, moisture contents on site may not be representative for the future state of the site. HSL scaling factors for different land use/chemicals/soils are presented in Appendix C of the Application Document and may be applied as described in Section 4.5.		Not applicable - baseline assessment

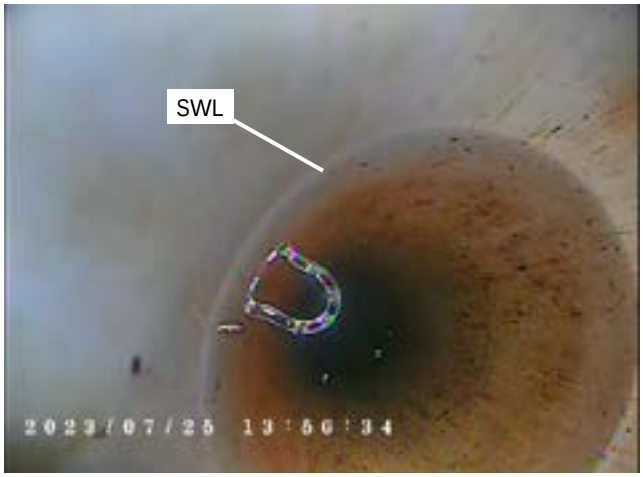
Step 7 – HSLs and adjustments (vapour intrusion) (cont.)		Comments
Saturation/solubility limits (soil and groundwater HSLs only)		
Apply the adjustments to the HSLs for vapour intrusion by multiplying by the determined factors.		
After applying the adjustments to the HSLs, is the revised HSL greater than the solubility / saturation limit? →	[X] Y - Indicates that the predicted source concentration to produce an unacceptable vapour risk is higher than the saturation point. The revised HSL is not limiting to vapour (NL). Note this does not apply to soils with direct contact. [ ] N - Revised HSL may be compared with measured source concentrations.	
Multi-Pathway Exposure		
1. Is inclusion of direct contact with soils required? →	[NA] Y - Repeat Step 6 with Adjusted Vapour Intrusion HSLs and Direct Contact HSLs [NA] N - Proceed to Question 2	
2. Is cross-scenario exposure required to be assessed?	[NA] Y - Repeat Step 6 with Adjusted Vapour Intrusion HSLs and Direct Contact HSLs [NA] N - Proceed to 'Screening assessment'	
Screening assessment		
Is the adjusted HSL less than source concentration? →	[ ] Y - Indicates potential health risk [X] N - Considered within acceptable health risks. If cancer endpoint (benzene) may also need to assess cancer risk level and cumulative cancer risk in Step 8	
Is the maximum soil, groundwater or soil-vapour concentration greater than the HSL by more than one or two orders of magnitude? →	[ ] Y - Indicates potential acute risk around hotspot [X] N - Considered within acceptable health risks	
If the screening assessment indicates the potential for unacceptable health risk, consideration may be given to further investigations such as further contaminantion deliniation, site-specific health risk assessment or site management. Before deciding the appropriate form of action considerations should include: - The magnitude of HSL exceedence - The nature of the source - The time frame required for managing health risks - Other statutory requirements		

Step 8 – Cancer risk assessment		Comments
Acceptable cancer risk (Refer to Section 5.1 of Application Document) HSLs for benzene have been based on 1 x 10^{-5} cancer risk. In some jurisdictions it may be required to assess carcinogenic risks based on 1 x 10^{-6} cancer risk. 1) The HSLs are linearly related to acceptable risk. HSLs based on a cancer risk of 1 x 10^{-6} may be calculated by dividing the HSLs in Appendix B by a factor of 10. 2) If the HSL is NL (vapour only HSL), it is possible that it may become limiting if the HSL is within a factor of 10 of the soil saturation concentration (or solubility limit for groundwater). 3) If soil or groundwater source concentration is less than an order of magnitude of the saturation concentration / solubility limit (in Appendix B), then even dividing the non-limiting HSL by 10 would result in an acceptable risk. Hence there is no need to proceed further. 4) If soil or groundwater source concentration is within an order of magnitude of the saturation concentration / solubility limit it is recommended to calculate the revised HSL from the non-limiting HSL. This process is outlined as follows: **Calculating revised HSL for 10^{-6} cancer risk from non-limiting HSL.** 1) The non-limiting HSLs are presented in Friebel & Nadebaum 2011 (Part 1). 2) The derived HSLs are presented in Appendix F. 3) Find the pages that correspond to the source type (soil, groundwater, soil vapour) for the given scenario (residential / commercial / recreational / intrusive maintenance). Note indicator chemicals and TPH have been separated. 4) For the corresponding soil category, depth and chemical, the Vapour Intrusion HSL and saturation/solubility concentration is presented in the columns on the right. 5) If this HSL is divided by 10 and the result is greater than Csat (for soil) or saturation limit (for groundwater), then the revised HSL is still NL. Otherwise the result is the revised Vapour HSL.		
Cumulative cancer risk (Refer to Section 3.6.1 of Application Document) HSLs for benzene have been based on 1 x 10^{-5} cancer risk. In most jurisdictions it is required to assess total carcinogenic risks based on 1 x 10^{-5} cancer risk. If HSLs are not NL for benzene and another carcinogenic chemical is identified, such as PAHs, follow the proedure outlined in Section 3.6.1. The cumulative fraction may also be applied to more than two chemicals. Note that multiple sources should be considered. For example, a resident may be exposed through direct contact with PAHs in surface soil, but also benzene vapours from soil and groundwater. For vapour risk (benzene), the risk contribution should consider the greatest risk for the receptor from all vapour sources. Because multiple sources do not have an additive effect, the source with the greatest risk needs to be identified (refer to Section 3.5 for discussion on multiple vapour sources). This means that for all sources/depths the source concentration should be divided by their respective HSLs to calculate the benzene contribution to cumulative risk. The highest fraction determines which source poses the greatest risk to receptors. The same may be carried out for carcinogenic PAHs. The sum of the highest benzene fraction and the highest PAH fraction results in the highest possible cumulative fraction.		

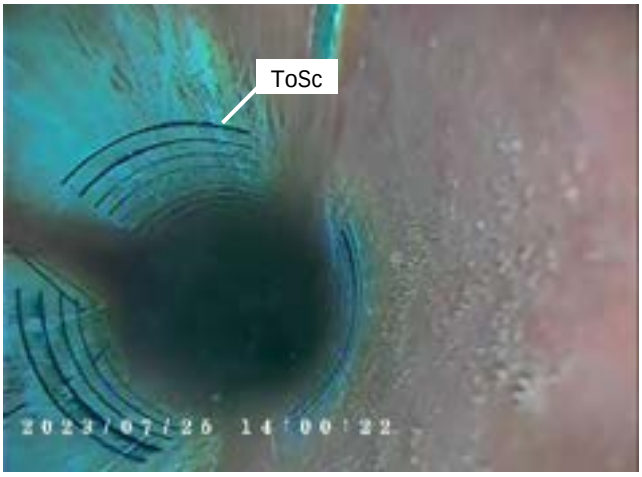
Appendix C – Site Photographs

SB1 soil profile.

SB1 location and soil characteristics.

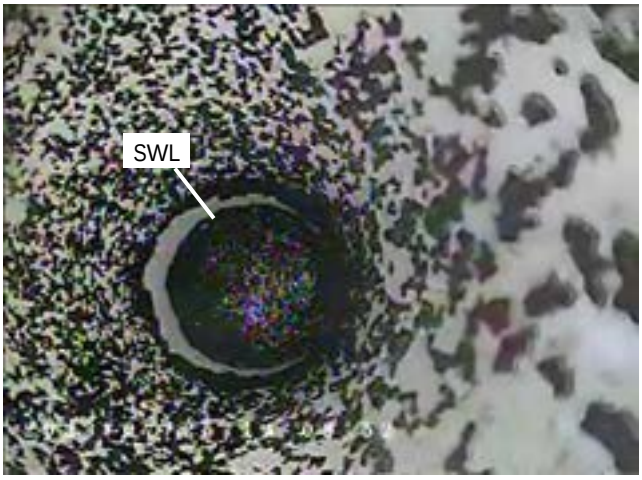


AB1S standing water level (SWL) 23.070 metres below top of casing (m btoc).



AB1S top of screened interval (ToSc) 30.8 m btoc.

AB1S debris build up on casing wall and bottom of well.



AB1D insect debris build up on casing wall above SWL at 21.780 m btoc.

AB1D insect debris build up on casing wall below SWL.

AB1D ToSc at 67.0 m btoc.

AB1D debris build up on casing wall and bottom of well.

VNB4S casing join showing PVC cement.

VNB4S casing below SWL of 30.686 m btoc.

VNB4S ToSc at 36.6 m btoc.

VNB4S bottom of well of 42.3 m btoc.

VNB4D insect debris at dry casing join 6.7 m btoc.

VNB4D blank casing condition.

VNB4D debris below SWL at 30.956 m btoc.

VNB4D ToSc at 66.9 m btoc.

VNB4D bottom of well at 78.4 m btoc.

Appendix H. Air Quality and GHG Monitoring Report

Appendix H.1 2021 Data

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Samantha Richardson
Chief Operating Officer
Bennett Resources Pty Ltd

11 March 2022

ERM Reference: 0594916

Dear Samantha,

Subject: Valhalla Baseline Air Quality Monitoring Six Monthly Report

1. INTRODUCTION

Bennett Resources Pty Ltd (BNR) has commissioned ERM Australia Pacific Pty Ltd (ERM) to provide oversight of the implementation of a baseline ambient air quality monitoring program for the Valhalla Gas Exploration and Appraisal Program (the Project). This report provides details of the monitoring locations, methodology, laboratory procedures, and monitoring results from 24 June 2021 to 21 November 2021.

2. MONITORING PROGRAM

The monitoring program has been implemented to gather information on baseline levels of the following pollutants:

- Particulate matter less than 10 microns in aerodynamic diameter (PM_{10});
- Particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$);
- Deposited dust;
- Volatile organic compounds (VOCs); and
- Methane.

Monitoring has been conducted across a total of five locations, inclusive of two locations in the proximity of community receptors (AQ_CS, AQ_CN) and three locations in the vicinity of proposed project infrastructure (AQ_S1-S3). These extend over a distance of approximately 66 km between the northernmost and southernmost monitoring locations.

The coordinates and pollutants monitored at each monitoring location are tabulated in Table 2.1. Figure 2.1 shows these locations overlaid on aerial imagery.

Table 2.1: Summary of monitoring locations and pollutants monitored

Location ID	Location (MGA94, Zone 51K)		Pollutants Monitored				
	Easting (mE)	Northing (mN)	$PM_{2.5}$	PM_{10}	Deposited Dust	VOCs	Methane
AQ_CS	696 179	7957 536	✓	✓	✓	✓	-
AQ_CN	676 816	8020 196	✓	✓	✓	✓	
AQ_S1	686 474	8003 892	-	-	-	-	✓
AQ_S2	696 945	7979 790	✓	✓	✓	✓	✓
AQ_S3	697 114	7973 523	-	-	-	-	✓

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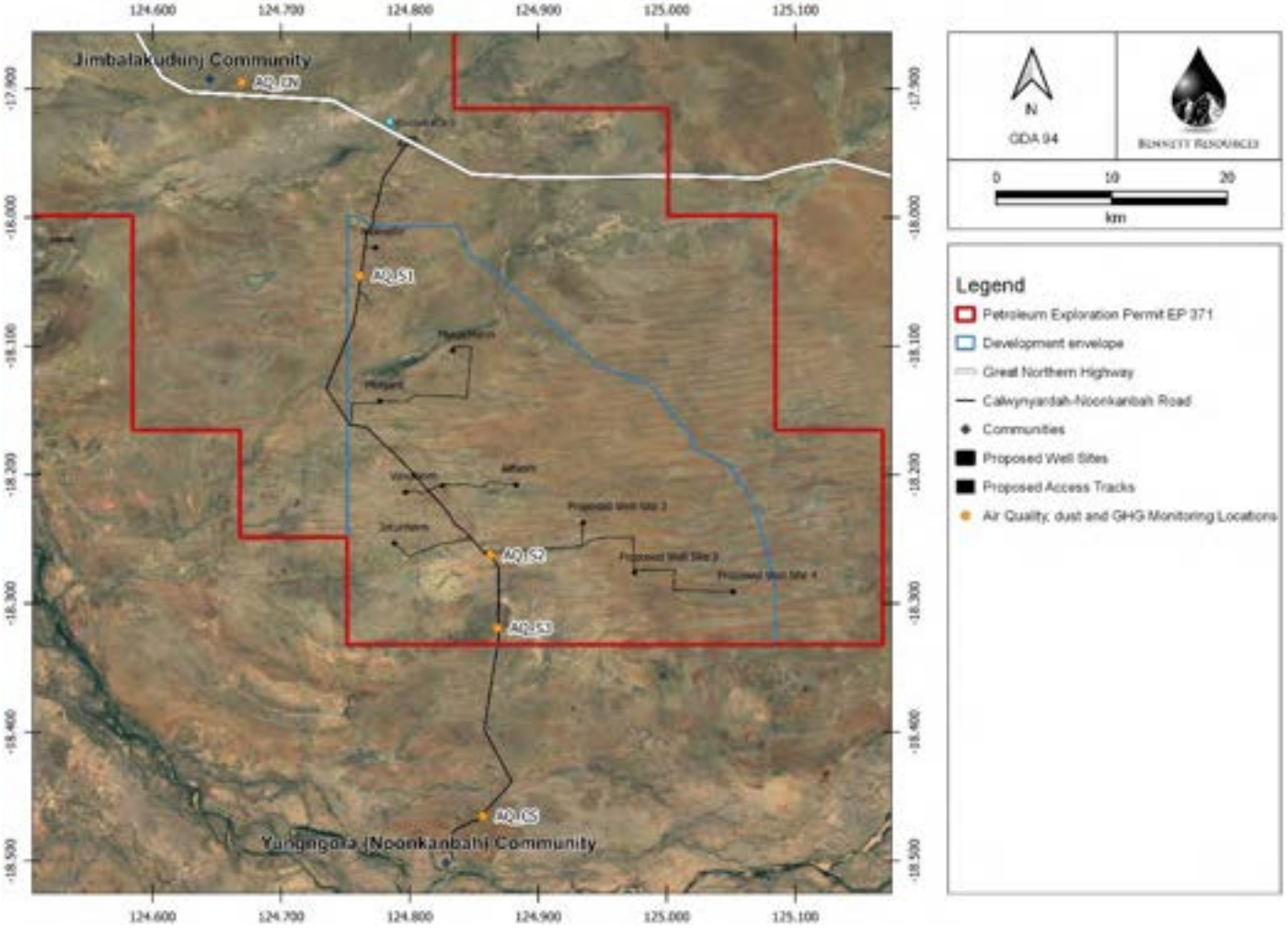

Figure 2.1: Aerial image showing monitoring locations

3. CLIMATE

As mentioned in Section 1, the baseline monitoring has been conducted between June and November. In the northern parts of Western Australia, the dry season is typically between May and October which covers five of the six months of the baseline monitoring. The wet season is typically between November and April. The closest Bureau of Meteorology (BoM) automatic weather station to the Project is Fitzroy Crossing Aerodrome, located approximately 75 km to the north east. Table 3.1 presents temperature and rainfall statistics for this station.

It is noted that the highest mean maximum temperature is experienced in November and the lowest mean minimum temperature is experienced in July. The highest mean rainfall is experienced during January and the lowest mean rainfall is experienced during September.

Table 3.1: Selected climate statistics for BoM Fitzroy Crossing Aerodrome (#3093)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean maximum temperature (°C)	37.6	36.9	37.1	36.9	33.3	30.5	31.1	33.4	37.5	40.3	40.9	39.3
Mean minimum temperature (°C)	25.2	24.8	24.0	20.8	16.0	13.1	12.3	13.6	18.5	23.1	25.6	25.8
Mean rainfall (mm)	185.8	144.4	108.1	24.9	15.8	6.5	5.2	2.6	0.4	13.9	31.4	136.2

4. MONITORING METHODOLOGY

4.1 Particulate matter

4.1.1 Overview

Monitoring of PM_{10} and $PM_{2.5}$ has been conducted at three locations using a Thomson Environmental Systems (TES) Dust Master Pro 7000 continuous monitors. The monitoring equipment was installed by Bennett Resources. Monitoring data was collected on an hourly basis and then 24-hour averages were calculated. The validated daily average PM_{10} and $PM_{2.5}$ concentrations have been provided by TES. The monitors were installed on 22 June and 23 June 2021.

4.1.2 Monitoring Criteria

The monitoring results have been compared against the National Environment Protection Measure Ambient Air Quality (NEPM AAQ) standards. Table 4.1 presents the NEPM AAQ standards for particulate matter.

Table 4.1: NEPM AAQ standards

Pollutant	Averaging Period	Criteria (µg/m³)	Source
Particulate matter (as PM_{10})	24 hour	50	National Environment Protection Measure Ambient Air Quality (NEPM AAQ)
	Annual	25	
Particulate matter (as $PM_{2.5}$)	24 hour	25	
	Annual	8	

4.2 Dust deposition

4.2.1 Sampling procedure

The monitoring of dust deposition has been conducted using dust deposition gauges. Sampling of deposited dust occurred in monthly intervals and has been conducted at three monitoring locations. The gauges were installed on 21 June and 22 June 2021.

4.2.2 Laboratory analysis

The dust deposition samples have been analysed for ash content, combustible matter and total insoluble matter by ALS Laboratories, who hold NATA accreditation for the analysis.

4.2.3 Monitoring Criteria

The deposited dust results have been compared against an annual average criterion of 4 g/m^2/month.

4.3 Volatile organic compounds (VOCs)

The sampling method has involved the collection of 24-hour time-integrated samples into 6-litre Silonite®-lined evacuated canisters, with canister preparation and post-sampling analysis undertaken by ALS laboratories who are NATA accredited for the TO-15 analytical method.

4.3.1 Sampling Procedure

Prior to sample collection, each canister is cleaned and laboratory certified. This procedure ensures that the canisters are free of residual contamination prior to sample collection. Sample collection involved connecting a calibrated flow regulator to the canister inlet and opening the inlet valve such that a sample is drawn into the canister at a steady, continuous rate over the 24-hour sampling period. At the completion of sampling, the canister valve is closed, the remaining vacuum recorded, and the canister returned to the laboratory for analysis.

4.3.2 Laboratory analysis

Evacuated canister samples have been analysed for the following VOCs:

- Benzene;
- Toluene;
- Ethylbenzene; and
- Xylenes (as sum of meta-, para- and ortho- isomers).

A ‘limit of reporting’ (LOR) of 0.5 parts per billion by volume (ppbv) was attained for each compound analysed via TO-15. In the case of xylenes, the LOR applies to each individual isomer, equating to a total LOR of 1.5 ppbv.

4.3.3 Laboratory Quality Control Procedures

Laboratory quality control (QC) procedures were undertaken on each sample batch to ensure the accuracy of the laboratory analysis. These procedures included:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits – The quality control term Laboratory Duplicate refers to a randomly selected intra-laboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity.

- Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Duplicate Control Spike (DCS) Report; Recovery and Acceptance Limits – The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control terms Laboratory Control Sample (LCS) and Laboratory Duplicate Control Sample (DCS) refers to certified reference materials, or known interference free matrices spiked with target analytes. The purpose of these QC parameters is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS and DCS.

All samples have been assessed to be compliant with all QC standards. A copy of the Chain of Custody (COC) documentation is provided in Appendix A. A copy of the Laboratory Certificates of Analysis is provided in Appendix B.

4.3.4 Screening Criteria

Screening criteria have been compiled to provide a means of assessing whether monitoring results are elevated so as to warrant additional investigation. With this objective, the following sources of screening criteria were adopted:

- NEPM Air Toxics Monitoring Investigation Levels (MILs), (NEPC, 2011); and
- ATSDR Minimal Risk Levels (MRLs), (ATSDR, 2017).

MILs provided within NEPC (2011) have been adopted as a priority, given their endorsement in a local context as part of the NEPM Air Toxics program. In this role, the MILs are applied by each state government in screening whether ambient VOC monitoring results are indicative of the need for detailed investigation.

ATSDR MRLs have been adopted as screening criteria for VOC/averaging period combinations for which MILs are not available. This approach has been adopted given the compatibility in the intended application of the MRLs, which are also provided as a screening tool for assessing where potential health effects should be considered more closely.

As further context, it is also noted the ATSDR MRLs are considered extensively in the derivation of MILs (NEPC, 2004), and are in some cases identical to the corresponding MILs (e.g. benzene). It is also noted that exceedances of either MILs or MRLs do not mean that adverse health effects will occur. Table 4.2 provides a summary of the adopted screening criteria.

Table 4.2: Summary of adopted screening criteria

VOC	Averaging Period	Screening Criteria (µg/m³)	Source
Benzene	24 hour	29	ATSDR (2017)
	Annual	9.6	NEPC (2011)
Toluene	24 hour	3,770	NEPC (2011)
	Annual	377	
Ethylbenzene	24 hour	21,700	ATSDR (2017)
	Annual	260	
Xylenes	24 hour	1,085	NEPC (2011)
	Annual	868	

Notes:

- ATSDR (2017) acute and chronic MRLs applied as representative of 24 hour and annual average criteria (respectively).
- All values converted from volumetric to mass-based units at conditions of 25°C and 1 atmosphere.

24-hour criteria are suitable for the assessment of individual monitoring results, whilst annual criteria are suitable for the assessment of average concentrations across multiple monitoring events.

5. MONITORING RESULTS

This section presents the monitoring results for particulate matter, the dust deposition, VOCs and methane from 24 June 2021 to 21 November 2021.

5.1 Particulate matter

Table 5.1 to Table 5.5 present the maximum 24-hour average and monthly average PM_{10} and $PM_{2.5}$ concentrations at the three monitoring locations for each month of the monitoring data.

Table 5.6 presents a summary of the maximum 24-hour average and monthly average PM_{10} and $PM_{2.5}$ concentrations at the three monitoring locations for all months of monitoring. For PM_{10}, Location 399 (AQ_S2) has the highest maximum 24-hour average concentration (303 µg/m^3), the highest period average (80.1 µg/m^3) and the most exceedances of the 24-hour average criterion at 96. For $PM_{2.5}$, Location 397 (AQ_CS) has the highest maximum 24-hour average concentration (30.3 µg/m^3), the highest period average (8.2 µg/m^3) and had the only exceedance of the 24-hour average criterion. Location 398 (AQ_CN) experienced the lowest values for both PM_{10} and $PM_{2.5}$ of the three sites.

The monitoring has been conducted for five months and for indicative purposes the period average from June to November has been compared to annual average criteria of 25 µg/m^3 and 8 µg/m^3 for PM_{10} and $PM_{2.5}$, respectively. There are exceedances of the annual average PM_{10} criteria at location 397 (AQ_CS) and location 399 (AQ_S2). There are exceedances of the annual average $PM_{2.5}$ criteria at location 397 (AQ_CS).

At monitoring location 397 (AQ_CS), there was either no data or insufficient data capture (due to solar power cuts) during the following dates:

- 8 July 2021;
- 2 September 2021 through to 20 October 2021; and
- 22 October 2021.

At monitoring location 398 (AQ_CN), there was no data collected on 24th June but this was the day of installation. All other dates have sufficient data capture.

At monitoring location 399 (AQ_S2), there was either no data or insufficient data capture (due to solar power cuts and battery issues) during the following dates:

- 11 October 2021 through to 20 October 2021; and
- 30 October 2021 through to 21 November 2021.

In addition, at this location there were 16 consecutive days from 16 August to 31 August where PM_{10} concentrations were 0.3 µg/m^3 or less and $PM_{2.5}$ concentrations were 0 µg/m^3. This data provided has been validated but it is worth noting.

Figure 5.1 to Figure 5.3 present the daily average PM_{10} and $PM_{2.5}$ concentrations at locations 397 (AQ_CS), 398 (AQ_CN) and 399 (AQ_S2) for the entire monitoring period.

Table 5.1: Summary of PM_{10} and $PM_{2.5}$ concentrations – June/July 2021

Parameter	Location			Units
	AQ_CS	AQ_CN	AQ_S2	
PM_{10}				
Maximum 24 hour average	85.8	14.9	282.3	µg/m³
Monthly average	27.5	9.1	100.2	
Exceedances of 24 hour criterion	5	0	25	-
$PM_{2.5}$				
Maximum 24 hour average	15.3	2.6	14.3	µg/m³
Monthly average	4.4	1.4	6.2	
Exceedances of 24 hour criterion	0	0	0	-

Table 5.2: Summary of PM_{10} and $PM_{2.5}$ concentrations – July/August 2021

Parameter	Location			Units
	AQ_CS	AQ_CN	AQ_S2*	
PM_{10}				
Maximum 24 hour average	95.3	23.5	303.0	µg/m³
Monthly average	33.0	13.1	104.5	
Exceedances of 24 hour criterion	6	0	24	-
$PM_{2.5}$				
Maximum 24 hour average	13.9	11.1	15.9	µg/m³
Monthly average	4.9	3.5	6.8	
Exceedances of 24 hour criterion	0	0	0	-

Notes: *Three days in this month where PM_{10} concentrations were equal to or less than 0.2 µg/m³ and $PM_{2.5}$ concentrations were 0 µg/m³.

Table 5.3: Summary of PM_{10} and $PM_{2.5}$ concentrations – August/September 2021

Parameter	Location			Units
	AQ_CS*	AQ_CN	AQ_S2**	
PM_{10}				
Maximum 24 hour average	134.4	48.0	244.2	µg/m³
Monthly average	64.4	21.6	54.0	
Exceedances of 24 hour criterion	9	6	21	-
$PM_{2.5}$				
Maximum 24 hour average	20.9	11.4	16.4	µg/m³
Monthly average	11.0	6.3	4.5	
Exceedances of 24 hour criterion	0	0	0	-

Notes: *Only 14 days of sufficient data capture at this location. ** 13 days in this month where PM_{10} concentrations were equal to or less than 0.3 µg/m³ and $PM_{2.5}$ concentrations were 0 µg/m³.

Table 5.4: Summary of PM_{10} and $PM_{2.5}$ concentrations – September/October 2021

Parameter	Location			Units
	AQ_CS	AQ_CN	AQ_S2*	
PM_{10}				
Maximum 24 hour average	NA	26.2	231.2	µg/m³
Monthly average	NA	15.0	74.8	
Exceedances of 24 hour criterion	NA	2	19	-
$PM_{2.5}$				
Maximum 24 hour average	NA	9.7	19.0	µg/m³
Monthly average	NA	5.2	7.2	
Exceedances of 24 hour criterion	NA	0	0	-

Notes: NA = insufficient data capture. * Only 21 days of sufficient data capture at this location.

Table 5.5: Summary of PM_{10} and $PM_{2.5}$ concentrations – October/November 2021

Parameter	Location			Units
	AQ_CS	AQ_CN	AQ_S2*	
PM_{10}				
Maximum 24 hour average	103.0	82.0	92.1	µg/m³
Monthly average	39.5	13.2	45.4	
Exceedances of 24 hour criterion	10	1	7	-
$PM_{2.5}$				
Maximum 24 hour average	30.3	15.0	6.3	µg/m³
Monthly average	13.1	4.4	5.8	
Exceedances of 24 hour criterion	1	0	0	-

Notes: *Only 7 days of sufficient data capture at this location.

Table 5.6: Summary of PM_{10} and $PM_{2.5}$ concentrations – June to November 2021

Parameter	Location			Units
	AQ_CS	AQ_CN	AQ_S2	
PM_{10}				
Maximum 24 hour average	134.4	82.0	303.0	µg/m³
6 monthly	38.3	14.7	80.1	
Exceedances of 24 hour criterion	61	9	96	-
$PM_{2.5}$				
Maximum 24 hour average	30.3	15.0	19.0	µg/m³
6 monthly average	8.2	4.3	6.0	
Exceedances of 24 hour criterion	1	0	0	-

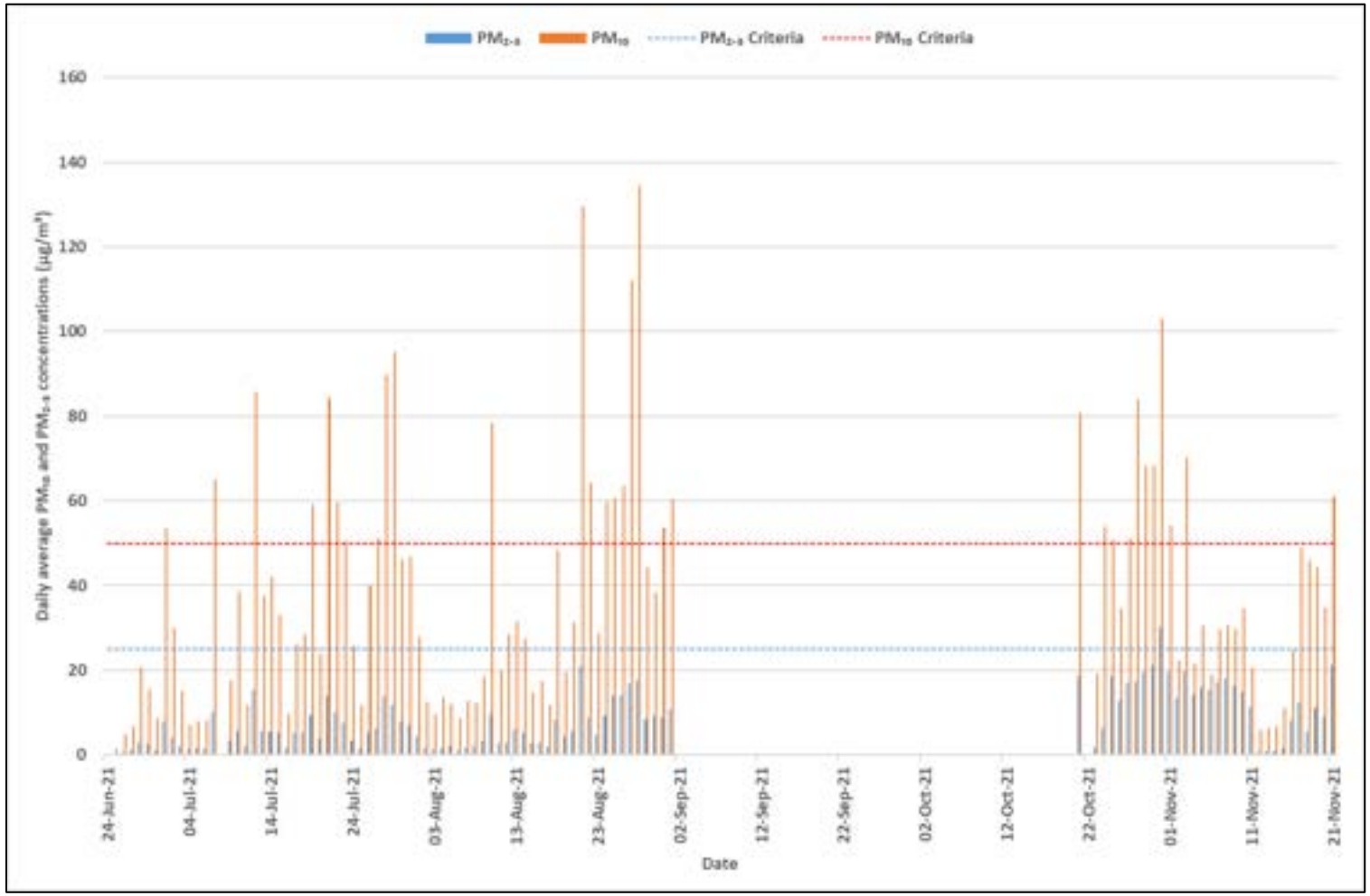

Figure 5.1: Daily average PM_{10} and $PM_{2.5}$ concentrations at location 397 (AQ_CS) from June 2021 to November 2021

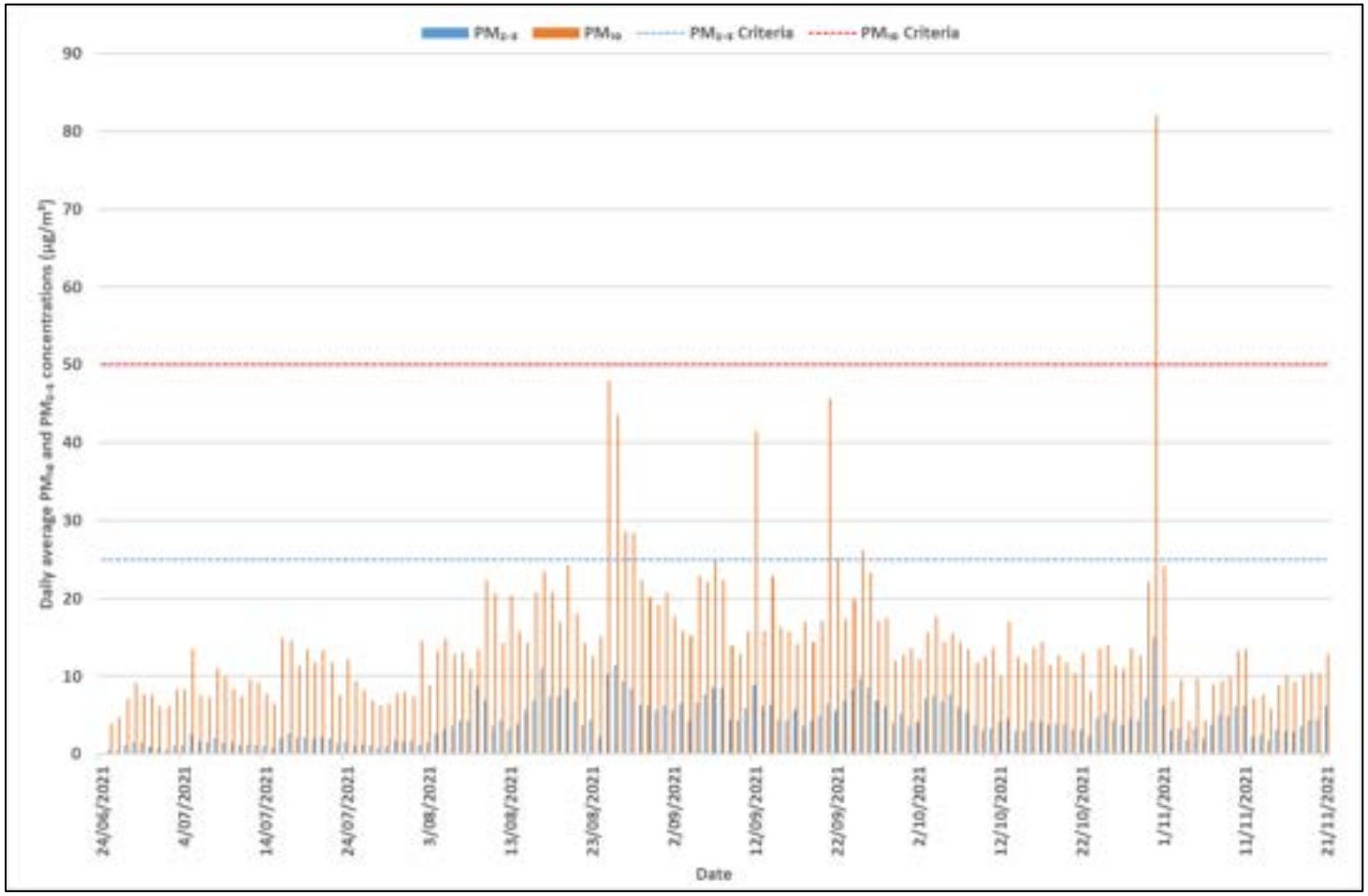

Figure 5.2: Daily average PM_{10} and $PM_{2.5}$ concentrations at location 398 (AQ_CN) from June 2021 to November 2021

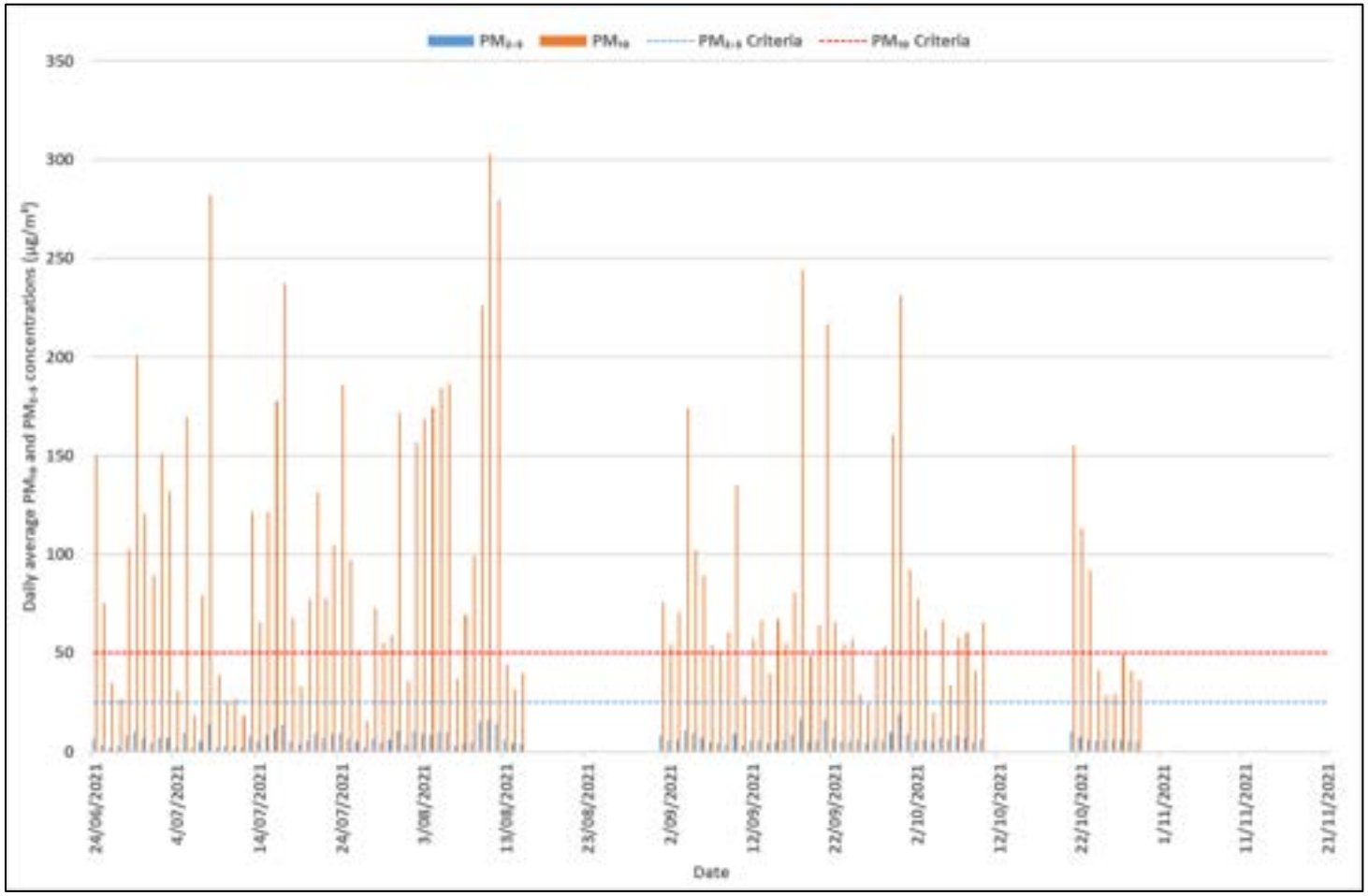

Figure 5.3: Daily average PM_{10} and $PM_{2.5}$ concentrations at location 399 (AQ_S2) from June 2021 to November 2021

5.2 Deposited dust

Table 5.7 presents the dust deposition results at the three monitoring locations. The six-month average of the total insoluble solids results is compared against the annual average criteria of 4 g/m^2/month. There are two exceedances of the adopted criteria for the period October/November, both in the location AQ_CS. Those exceedances are 19.9 g/m^2/month of ash content and 21.5 g/m^2/month of total insoluble matter. During October, it is noted that there was a significant fire around the three monitoring locations (NAFI, 2022).

In June/July and July/August, the lower PM concentrations seen in the continuous monitoring at AQ_CN is reflected in the dust deposition results.

Table 5.7: Summary of dust deposition results

Period	AQ_CS			AQ_CN			AQ_S2		
	Ash Content	Comb. Matter	Total Insoluble Matter	Ash Content	Comb. Matter	Total Insoluble Matter	Ash Content	Comb. Matter	Total Insoluble Matter
Jun / Jul	1	<0.1	**1**	0.5	<0.1	**0.5**	1.6	0.7	**2.3**
Jul / Aug	2	0.3	**2.3**	0.2	<0.1	**0.2**	1.2	0.1	**1.3**
Aug / Sep	3.2	0.8	**4.0**	2.2	1.2	**3.4**	0.9	0.1	**1.0**
Sep / Oct	2.1	0.1	**2.2**	0.5	0.1	**0.6**	0.9	<0.1	**0.9**
Oct / Nov	19.9	1.6	**21.5**	0.9	<0.1	**0.9**	2.1	0.2	**2.3**
Average	5.6	0.6	**6.2**	0.9	0.3	**1.1**	1.3	0.2	**1.6**
Criterion	-	-	***4****	-	-	***4****	-	-	***4****

Note: "<" – Less than limit of reporting (LOR). *Average of 6 monthly samples compared to annual criterion for contextual purposes.

5.3 VOCs

Table 5.8 provides a summary of reported concentrations for VOCs at three monitoring locations AQ_CS, AQ_CN and AQ_S2. There are no positive detections from any of the samples. Table 5.9 provides comparison of these results to the screening criteria identified in Section 4.3.4. All samples are significantly lower than respective adopted screening criteria.

Table 5.8: Summary of reported VOC concentrations – June to November 2021

Month	Reported Concentration (All locations) - µg/m³			
	Benzene	Toluene	Ethylbenzene	Xylenes
June	<1.6	<1.9	<2.2	<6.5
July	<1.6	<1.9	<2.2	<6.5
August	<1.6	<1.9	<2.2	<6.5
September	<1.6	<1.9	<2.2	<6.5
October	<1.6	<1.9	<2.2	<6.5
November	<1.6	<1.9	<2.2	<6.5

Note - "<": Less than Limit of Reporting (LOR).

Table 5.9: Screening reported VOC concentrations – June to November 2021

VOC	Statistic	Maximum Result	Screening Criteria (µg/m³)	Source
Benzene	Maximum 24 hour average	<1.6	29	ATSDR (2017)
	Average	<1.6	9.6*	NEPC (2011)
Toluene	Maximum 24 hour average	<1.9	3,770	NEPC (2011)
	Average	<1.9	377*	
Ethylbenzene	Maximum 24 hour average	<2.2	21,700	ATSDR (2017)
	Average	<2.2	260*	
Xylenes	Maximum 24 hour average	<6.5	1,085	NEPC (2011)

Notes - "<": Less than Limit of Reporting (LOR). *Average of 6 monthly samples compared to annual criterion for contextual purposes.

5.4 Methane

Table 5.10 provides a summary of reported concentrations for methane at the three monitoring locations. There are no positive detections from any of the samples.

Table 5.10: Summary of methane monitoring results

Month	Reported Methane Concentration - mg/m³		
	AQ_S1	AQ_S2	AQ_S3
June	<6.6	<6.6	<6.6
July	<6.6	<6.6	<6.6
August	<6.6	<6.6	<6.6
September	<6.6	<6.6	<6.6
October	<6.6	<6.6	<6.6
November	<6.6	<6.6	<6.6

Notes - "<": Less than Limit of Reporting (LOR).

6. CONCLUSIONS

BNR has conducted ambient air quality monitoring of particulate matter, deposited dust, VOCs and methane at multiple locations in the vicinity of the proposed Valhalla Gas Exploration and Appraisal Program during June 2021 to November 2021.

The monitoring has been primarily undertaken during the dry season which typically lasts from May to October. For the purposes of contextualising the results of this monitoring, annual criteria have been adopted as proxy criteria for comparison against the six-month averages. Noting that particulate matter from both wind erosion and vehicle transit on unsealed roads, and VOCs from bushfire activity are less prevalent with increased moisture in the environment, the approach of evaluating six months of dry season data against annual averages is considered conservative.

Table 6.1 presents a summary of the monitoring results for AQ_CS, AQ_CN and AQ_S2, with comparison against respective criteria.

Table 6.1: Summary of Air Quality Monitoring Results (µg/m³)

Month	Monitoring Statistic	Monitoring Location			Criterion*
		AQ_CS	AQ_CN	AQ_S2	
PM_{10}	Peak 24 hour average	134.4	82.0	303.0	50
	6 monthly average	38.3	14.7	80.1	25*
$PM_{2.5}$	Peak 24 hour average	30.3	15.0	19.0	25
	6 monthly average	8.2	4.3	6.0	8*
Deposited Dust	6 monthly average	6.2	1.1	1.6	4*
Benzene	Maximum 24 hour average	<1.6	<1.6	<1.6	29
	6 monthly average	<1.6	<1.6	<1.6	9.6*
Toluene	Maximum 24 hour average	<1.9	<1.9	<1.9	3,770
	6 monthly average	<1.9	<1.9	<1.9	377*
Ethylbenzene	Maximum 24 hour average	<2.2	<2.2	<2.2	21,700
	6 monthly average	<2.2	<2.2	<2.2	260*
Xylenes	Maximum 24 hour average	<6.5	<6.5	<6.5	1,085
	6 monthly average	<6.5	<6.5	<6.5	868*

Note: *Annual average criteria (marked by an asterisk) have been adopted as proxy criteria for comparison against the six-month averages

For $PM_{10,}$ AQ_S2 reported the highest maximum 24-hour average concentration (303 µg/m^3), the highest period average (80.1 µg/m^3) and the most exceedances of the 24-hour average criterion at 96 events. For $PM_{2.5}$, AQ_CS has the highest maximum 24-hour average concentration (30.3 µg/m^3), the highest period average (8.2 µg/m^3) and had the only exceedance of the 24-hour average criterion. AQ_CN experienced the lowest PM_{10} and $PM_{2.5}$ concentrations of the three sites.

For contextual purposes, the six-month average monitoring results have been compared to annual average criteria of 25 µg/m^3 and 8 µg/m^3 for PM_{10} and $PM_{2.5}$, respectively. Average PM_{10} concentrations were higher than the annual average PM_{10} criterion at location AQ_CS and location AQ_S2, with the magnitude of measurements at AQ_CS indicating an exceedance of the annual average criterion irrespective of concentrations present during the wet season.

The average $PM_{2.5}$ concentration was higher than the annual average $PM_{2.5}$ criterion at location AQ_CS. Given that particulate matter concentrations are anticipated to be lower during the wet season, this result is not necessarily indicative of an exceedance of the annual average criterion.

The monitoring results for the deposited dust showed variable dust deposition rates, with the highest results located at AQ_CS, for which the six monthly average was greater than the annual average criterion. Given that deposition rates are anticipated to be lower during the wet season, this result is not necessarily indicative of an exceedance of the annual average deposition criterion.

The results of the VOC monitoring have been screened against Australian and US criteria that are nominated for use in the evaluation of ambient monitoring data, for identification of whether additional investigation is required. There were no positive detections present for any VOCs, and all results were significantly lower than respective screening criteria.

Methane monitoring results were less than the limit of reporting of 6.6 mg for locations AQ_S1, AQ_S2 and AQ_S3. Noting that this monitoring is not aligned with ambient air quality outcomes, these data have not been screened against any criterion.

7. STATEMENT OF LIMITATIONS

1. This report is based solely on the scope of work described in proposal 'P0594916var1 Air Quality Monitoring Support Valhalla rev1.pdf' performed by Environmental Resources Management Australia Pacific Pty Ltd (**ERM**) for Bennett Resources (the **Client**). The Scope of Work was governed by a contract between ERM and the Client (**Contract**).

2. No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.

3. The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.

4. This report was prepared between September 2021 and March 2022 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.

5. This report is based on analyses described in the report, and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:

    a. did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;

    b. assumes no responsibility or liability for errors in data obtained from, the Client, any third parties or external sources (including regulatory agencies).

6. Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.

7. Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:

    a. the suitability of the site(s) for any purpose or the permissibility of any use;

    b. the presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or

    c. the presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).

8. Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.

9. The ongoing use of the site or use of the site for a different purpose may require the management of or remediation of site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.

10. This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.

11. Except to the extent that ERM has agreed otherwise with the Client in the Scope of Work or the Contract, this report:

    a. has been prepared and is intended only for the exclusive use of the Client and the appointed contaminated land auditor;

    b. must not to be relied upon or used by any other party;

    c. has not been prepared nor is intended for the purpose of advertising, sales, promoting or endorsing any Client interests including raising investment capital, recommending investment decisions, or other publicity purposes;

    d. does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and

    e. does not purport to provide, nor should be construed as, legal advice.

8. REFERENCES

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US EPA 1999, *Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analysed by Gas Chromatography / Mass Spectrometry (GC/MS)*, Second Edition, Centre for Environmental Research Information Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati OH, 1999.

For ERM Australia Pacific Pty Ltd

Christopher Thomson
Principal Consultant

Karie Bradfield
Partner

APPENDIX A – LABORATORY CHAIN OF CUSTODY DOCUMENTATION

STARTRACK : 3HGZ 0000 5375

AIR CANISTER CHAIN OF CUSTODY

ALS

If sourced from an ALS Laboratory: please tick →

Client Supplied Canister(s)? Y / N

CLIENT: Bennett Resources Pty Ltd	TURNAROUND REQUIREMENTS: ☒ Standard TAT (List due date): 30/07/21	LABORATORY USE ONLY (Circle) Receipt of Initial and date/time	
OFFICE: [redacted]	(Standard TAT may be extended for multiple sequential analysis suites) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Rec Lab Y / N NE Y / N N/A	
PROJECT: Air Quality Monitoring PROJECT NO:	ALS QUOTE NO.: NE/066/21	COC SEQUENCE NUMBER (Circle)	Valves closed on Receipt? Rec Lab Y / N NE Y / N N/A
CANISTER REQUEST NO: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN: Australia	COC: 1 2 3 4 5 6 7	Canister/Sampler Complete and Not Damaged: Yes / No
PROJECT MANAGER: [redacted]	CONTACT PH: [redacted]	OF: 1 2 3 4 5 6 7	Other comment: Temperature °C
SAMPLER: [redacted]	SAMPLER MOBILE: [redacted]	RELINQUISHED BY:	RELINQUISHED BY:
COC Emailed to ALS? (YES / NO)	EDD FORMAT (or default):		
Email Reports to (will default to PM if no other addresses are listed): [redacted]	RECEIVED BY: 19.7.21 9:40	RECEIVED BY:	RECEIVED BY:
Email Invoice to (will default to PM if no other addresses are listed): [redacted]			

COMMENTS/SPECIAL HANDLING/REPLACEMENT OR RETURN INSTRUCTIONS:

GAS SAMPLE CONTAINER INFORMATION

ALS USE ONLY	CANISTER / SAMPLE DETAILS					Canister Gauge Pressures (PSI)		Refer to Canister Verification Reports and COAs for pressures measured by the Lab					ANALYSES REQUESTED						Additional Information
								Reporting Requirements					Suite Codes must be listed to attract suite price						
								LORs			Units								
LAB ID	CANISTER SERIAL NO.	FLOW CONTROLLER SERIAL NO.	CLIENT SAMPLE ID	DATE / TIME SAMPLED	MATRIX (eg Air, Soil Gas)	Pre-Sampling	Post Sampling	Ambient Air	Soil Gas (NEPM)	Other / Indoor	ppbv, µg/m³	ppbv, mg/m³	EP101-BTEXN (TO15)	EP 104L-M					Comments on LORs required, potential hazards, likely contaminant levels, or samples requiring specific QC analysis etc. (LOR defaults to routine method LOR after dilution)
1	12620	1620	AQ_CS	24/06/21 9:30am	Air	-27.5" Hg	-3" Hg	X			X		X						
2	4984	2848	AQ_S2	23/06/21 10:40am	Air	-28" Hg	-2" Hg	X			X		X	X					
3	12642	2839	AQ_CN	23/06/21 14:30pm	Air	-30" Hg	-2" Hg	X			X		X						
4	12647	2833	AQ_S3	24/06/21 10:30am	Air	-30" Hg	-2" Hg	X			X			X					
5	4781	1830	AQ_S1	24/06/21 12:40pm	Air	-30" Hg	0" Hg	X			X			X					

Environmental Division
Newcastle
Work Order Reference
EN2105364

Telephone : 61 2 4014 2500

Job Specific Instructions:

TNT: 9835 0751 2950

AIR CANISTER CHAIN OF CUSTODY

If sourced from an ALS Laboratory: please tick →

Client Supplied Canister(s)? Y / N

CLIENT:	Bennett Resources Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be extended for multiple sequential analysis suites)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	[redacted]		
PROJECT Name/No:	Air Quality Monitoring	ALS QUOTE NO.: NE/068/21	
PURCHASE ORDER NO.:		COUNTRY OF ORIGIN: Australia	
PROJECT MANAGER:	[redacted]	CONTACT PH: [redacted]	
SAMPLER:	[redacted]	SAMPLER MOBILE [redacted]	
COC Emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to (will default to PM if no other addresses are listed):	[redacted]		
Email Invoice to (will default to PM if no other addresses are listed):	[redacted]		

COC SEQUENCE NUMBER (Circle)

COC: (1) 2 3 4 5 6 7

OF: (1) 2 3 4 5 6 7

LABORATORY USE ONLY (Circle) *Receiver to initial and date/time*

Custody Seal Intact? Rec Lab Y / N NE Y / N (N/A)

Valves closed on Receipt? Rec Lab Y / N NE Y / N N/A

Canister/Sampler Complete and Not Damaged (Yes) No

Other comment: Temperature °C

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
[redacted] Signature and date/time	Signature and date/time	Signature and date/time	Signature and date/time
RECEIVED BY: 10/8/21 9:00	RECEIVED BY:	RECEIVED BY:	RECEIVED BY:
Signature and date/time	Signature and date/time	Signature and date/time	Signature and date/time

COMMENTS/SPECIAL HANDLING/REPLACEMENT OR RETURN INSTRUCTIONS:

GAS SAMPLE CONTAINER INFORMATION

Canister Gauge Pressures (PSI)

Refer to Canister Verification Reports and COAs for pressures measured by the Lab

ANALYSES REQUESTED

Suite Codes must be listed to attract suite price

Additional Information

Comments on **LORs required, potential hazards**, likely contaminant levels, or samples requiring specific QC analysis etc (LOR defaults to routine method LOR after dilution)

ALS USE ONLY	CANISTER / SAMPLE DETAILS					Canister Gauge Pressures (PSI)		Reporting Requirements					Suite Codes must be listed to attract suite price						Additional Information
								LORs			Units								
LAB ID	CANISTER SERIAL NO.	FLOW CONTROLLER SERIAL NO.	CLIENT SAMPLE ID	DATE / TIME SAMPLED	MATRIX (eg Air, Soil Gas)	Pre-Sampling	Post Sampling	Ambient Air	Soil Gas (NEPM)	Other / Indoor	ppbv, µg/m³	ppmv, mg/m³	EP101-BTEXN (USEPA TO15)	EP104L-M (in house, ASTM D1945)					
1	40220	15007	AQ_CN	22/7/21/1052	Air	30	4	X			X		X						
2	40227	15015	AQ_CS	22/7/21/0837	Air	30	3	X			X		X						
3	40215	1614	AQ_S2	22/7/21/0916	Air	30	0	X			X		X	X					
4	40249	15029	AQ_S1	22/7/21/0904	Air	30	1.5	X			X			X					
5	40214	15018	AQ_S3	22/7/21/1020	Air	30	2.5	X			X			X					

Environmental Division
Newcastle
Work Order Reference
EN2106972

Telephone : 61 2 4014 2500

Job Specific Instructions:

Approval Date: 22/04/2014

TNT : 9835 0751 2961

AIR CANISTER CHAIN OF CUSTODY

ALS

If sourced from an ALS Laboratory: please tick →

Client Supplied Canister(s)? Y / N

CLIENT:	Bennett Resources Pty Ltd	**TURNAROUND REQUIREMENTS :** (Standard TAT may be extended for multiple sequential analysis suites)	☒ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	[redacted]		
PROJECT Name/No:	Air Quality Monitoring	**ALS QUOTE NO.:** NE/068/21	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
PURCHASE ORDER NO.:		**COUNTRY OF ORIGIN:** Australia	
PROJECT MANAGER:	[redacted]	**CONTACT PH:** [redacted]	
SAMPLER:	[redacted]	**SAMPLER MOBILE:** [redacted]	
COC Emailed to ALS? (YES / NO)		**EDD FORMAT (or default):**	
Email Reports to (will default to PM if no other addresses are listed):	[redacted]		
Email Invoice to (will default to PM if no other addresses are listed):	[redacted]		

LABORATORY USE ONLY (Circle) *Receiver to initial and date/time*

Custody Seal Intact? Rec Lab Y / N NE Y / N N/A

Valves closed on Receipt? Rec Lab Y / N NE Y / N N/A

Canister/Sampler Complete and Not Damaged: Yes No

Other comment: Temperature °C

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[redacted]	21/9/21 8:45		
Signature and date/time	Signature and date/time	Signature and date/time	Signature and date/time

COMMENTS/SPECIAL HANDLING/REPLACEMENT OR RETURN INSTRUCTIONS:

GAS SAMPLE CONTAINER INFORMATION

Canister Gauge Pressures (PSI)

Refer to Canister Verification Reports and COAs for pressures measured by the Lab

ANALYSES REQUESTED

Suite Codes must be listed to attract suite price

Additional Information

Comments on LORs required, potential hazards, likely contaminant levels, or samples requiring specific QC analysis etc. (LOR defaults to routine method LOR after dilution)

ALS USE ONLY	CANISTER / SAMPLE DETAILS					Canister Gauge Pressures (PSI)		Reporting Requirements					ANALYSES REQUESTED						Additional Information
								LORs			Units		Suite Codes must be listed to attract suite price						
LAB ID	CANISTER SERIAL NO.	FLOW CONTROLLER SERIAL NO.	CLIENT SAMPLE ID	DATE / TIME SAMPLED	MATRIX (eg Air, Soil Gas)	Pre-Sampling	Post Sampling	Ambient Air	Soil Gas (NEPM)	Other / Indoor	ppbv, µg/m³	ppmv, mg/m³	EP101-BTEXN (USEPA TO15)	EP104L-M (in house, ASTM D1945)					
1	4973	12202	AQ_CN	18/08/21 8:15am	Air	-29	-3	X			X		X						
2	40211	15007	AQ_CS	18/08/21 12:44pm	Air	-32	-10	X			X		X						-10 on canister but 2" Hg remaining on sampler
3	4763	1613	AQ_S2	18/08/21 10:12am	Air	-31	-2	X			X		X	X					
5	40221	1620	AQ_S1	18/08/21 9:33am	Air	-31	-4	X			X			X					
4	4991	12208	AQ_S3	18/08/21 11:12am	Air	-30	-1	X			X			X					

Site was very windy

Environmental Division
Newcastle
Work Order Reference
EN2108023

Job Specific Instructions:

TNT.

AIR CANISTER CHAIN OF CUSTODY

If sourced from an ALS Laboratory: please tick →

Client Supplied Canister(s)? Y / N

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5800 E: gladston@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT:	Bennett Resources Pty Ltd	**TURNAROUND REQUIREMENTS :** (Standard TAT may be extended for multiple sequential analysis suites)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	[redacted]		
PROJECT Name/No:	Air Quality Monitoring	**ALS QUOTE NO.:**	NE/066/21
PURCHASE ORDER NO.:		**COUNTRY OF ORIGIN:**	Australia
PROJECT MANAGER:	[redacted]	**CONTACT PH:**	[redacted]
SAMPLER:		**SAMPLER MOBILE:**	
COC Emailed to ALS?	(YES / NO)	**EDD FORMAT (or default):**	
Email Reports to (will default to PM if no other addresses are listed):	[redacted]		
Email Invoice to (will default to PM if no other addresses are listed):	[redacted]		

COC SEQUENCE NUMBER (Circle)

COC: (1) 2 3 4 5 6 7

OF: (1) 2 3 4 5 6 7

LABORATORY USE ONLY (CIRCLE)

Custody seal intact? YES / NO / N/A

Cooler present? YES / NO / N/A

Receipt temperature: [redacted] °C

Canister pressure/vacuum on receipt: YES / NO / N/A

Other comments:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature and date/time	Signature and date/time	Signature and date/time	Signature and date/time
RECEIVED BY: 21/10/21 11:20	RECEIVED BY:	RECEIVED BY:	RECEIVED BY:
Signature and date/time	Signature and date/time	Signature and date/time	Signature and date/time

COMMENTS/SPECIAL HANDLING/REPLACEMENT OR RETURN INSTRUCTIONS:

GAS SAMPLE CONTAINER INFORMATION

Canister Gauge Pressures (PSI)

Refer to Canister Verification Reports and COAs for pressures measured by the Lab

ANALYSES REQUESTED

Suite Codes must be listed to attract suite price

Additional Information

Comments on **LORs required, potential hazards, likely contaminant levels, or samples requiring specific QC analysis etc.** (LOR defaults to routine method LOR after dilution)

ALS use only:	CANISTER / SAMPLE DETAILS					Pre-Sampling	Post Sampling	Reporting Requirements: LORs			Units		EP101-BTEXN (USEPA TO15)	EP104L-M (in house, ASTM D1945)					
LAB ID	CANISTER SERIAL NO.	FLOW CONTROLLER SERIAL NO.	CLIENT SAMPLE ID	DATE / TIME SAMPLED	MATRIX (eg Air, Soil Gas)			Ambient Air	Soil Gas (METRI)	Other / Indoor	ppbv, µg/m³	ppmv, mg/m³							
	12635	12204	AQ_CN	21/10/21 1100	Air	30	1	X			X		X						
	4973	1620	AQ_CS	21/10/21 0919	Air	29	2	X			X		X						
	40205	1613	AQ_S2	21/10/21 1000	Air	30	2	X			X		X	X					
	40239	1614	AQ_S1	21/10/21 1030	Air	29	1	X			X			X					
	40200	2846	AQ_S3	21/10/21 0945	Air	30	2	X			X			X					

Environmental Division Newcastle

Work Order Reference

EN2109685

Telephone : +61 2 4014 2500

Job Specific Instructions:

TNT. 983507513332.

AIR CANISTER CHAIN OF CUSTODY

If sourced from an ALS Laboratory: please tick →

Client Supplied Canister(s)? Y / N

CLIENT:	Bennett Resources Pty Ltd	TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date): (Standard TAT may be extended for multiple sequential analysis suites) ☐ Non Standard or urgent TAT (List due date):	LABORATORY USE ONLY (Circle) Receiver to initial and date/time: Custody Seal Intact? Rec Lab Y / N NE Y / N N/A; Valves closed on Receipt? Rec Lab Y / N NE Y / N N/A; Canister/Sampler Complete and Not Damaged Yes No; Other comment: Temperature °C:
OFFICE:	[redacted]		
PROJECT Name/No:	Air Quality Monitoring	ALS QUOTE NO.: NE/066/21	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
PURCHASE ORDER NO.:		COUNTRY OF ORIGIN: Australia	
PROJECT MANAGER:	[redacted]	CONTACT PH: [redacted]	
SAMPLER:	[redacted]	SAMPLER MOBILE:	
COC Emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to (will default to PM if no other addresses are listed):	[redacted]		
Email Invoice to (will default to PM if no other addresses are listed):	[redacted]		

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature and date/time	Signature and date/time	Signature and date/time	Signature and date/time
RECEIVED BY: KS 26.11.21 09:15 am	RECEIVED BY:	RECEIVED BY:	RECEIVED BY:
Signature and date/time	Signature and date/time	Signature and date/time	Signature and date/time

COMMENTS/SPECIAL HANDLING/REPLACEMENT OR RETURN INSTRUCTIONS:

GAS SAMPLE CONTAINER INFORMATION

Canister Gauge Pressures (PSI) — Refer to Canister Verification Reports and COAs for pressures measured by the Lab

ANALYSES REQUESTED — Reporting Requirements — Suite Codes must be listed to attract suite price

Additional Information — Comments on LORs required, potential hazards, likely contaminant levels, or samples requiring specific QC analysis etc. (LOR defaults to routine method LOR after dilution)

ALS USE ONLY	CANISTER / SAMPLE DETAILS					Pre-Sampling	Post Sampling	LORs: Ambient Air	LORs: Soil Gas (NEPM)	LORs: Other / Indoor	Units: ppbv, µg/m³	Units: ppmv, mg/m³	EP101-BTEXN (USEPA TO15)	EP104L-M (in house, ASTM D1945)					
LAB ID	CANISTER SERIAL NO.	FLOW CONTROLLER SERIAL NO.	CLIENT SAMPLE ID	DATE / TIME SAMPLED	MATRIX (eg Air, Soil Gas)														
	40217	2933	AQ_CN	16/11/21 0720	Air	30	10	X			X		X						
	40222	1619	AQ_CS	16/11/21 0920	Air	30	1	X			X		X						
	40215	1616	AQ_S2	16/11/21 0830	Air	28	0	X			X		X	X					
	40212	1615	AQ_S1	16/11/21 0800	Air	30	0	X			X			X					
	12647	1617	AQ_S3	16/11/21 0845	Air	30	5	X			X			X					

Environmental Division
Newcastle
Work Order Reference
EN2110478

Telephone : +61 2 4014 2500

Job Specific Instructions:

CHAIN OF CUSTODY

ALS laboratory: please tick →

ADELAIDE 3/1 Burma Road Pooraka SA 5095 Ph: 08 8162 5130 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 48 Callemondah Drive Gladstone QLD 4680 Ph: 07 4796 7494 E: ALSEnviro.Gladstone@alsglobal.com

MACKAY Unit 2/20 Caterpillar Drive Paget QLD 4740 Ph: 07 4952 5735 E: ALSEnviro.Mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 129 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: samples.mudgee@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

ORANGE 4/13 Geary Place North Orange NSW 2800 Ph: 02 4423 2063 E: orange@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com

WOLLONGONG 1/19-21 Ralph Black Drive, North Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Bennett Resources Pty Ltd	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle)
OFFICE: [redacted]			Custody Seal Intact? Yes No N/A
PROJECT: Air Quality Monitoring PROJECT NO.	ALS QUOTE NO.: NE/066/21	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN: Australia	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: [redacted] CONTACT PH [redacted]		OF: 1 2 3 4 5 6 7	Other comment:

SAMPLER:	SAMPLER MOBILE:	RELINQUISHED BY:	RELINQUISHED BY:	RECEIVED BY:
COC Emailed to ALS? (YES / NO)	EDD FORMAT (or default):		[redacted]	
Email Reports to (will default to PM if no other addresses are listed):		DATE/TIME:	DATE/TIME: 27/07/21	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): [redacted]				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	A04 Partial Dust Analysis (TSP + CM + AC) (AS 3580: 10.1)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	AQ_CN		S	Dust gauge bottle - copper sulfate	1	X							
	AQ_CS		S	Dust gauge bottle - copper sulfate	1	X							
	AQ_S2		S	Dust gauge bottle - copper sulfate	1	X							
				TOTAL									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag. U = Tuegols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Environmental Division
Newcastle
Work Order Reference
EN2105415

Telephone : + 61 2 4014 2500

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053
Ph: 07 3243 7222 E: brisbane@alsglobal.com

DARWIN 16 Ptarmigan Court Winnellie NT 0820
Ph: 08 8978 5044 E: darwin@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740
Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 4 Westall Rd Springvale VIC 3171
Ph: 03 8549 9600 E: melbourne@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7655 E: perth@alsglobal.com

SINGAPORE 1 Harper Road #06-05 Leong Huat Building Singapore 369961
Ph: +65 6733 1605 E: singapore@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Ph: 07 4796 0600 E: townsville@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Bennett Resources Pty Ltd	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☒ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: [redacted]		Custody Seal Intact? Yes No N/A
PROJECT: Air Quality Monitoring **PROJECT NO.**	**ALS QUOTE NO.:** NE/066/21	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: **PURCHASE ORDER NO.:**	**COUNTRY OF ORIGIN:** Australia	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7
PROJECT MANAGER: [redacted] **CONTACT PH:** [redacted]		OF: 1 2 3 4 5 6 7
SAMPLER: [redacted] **SAMPLER MOBILE:** [redacted]	**RELINQUISHED BY** [redacted] 24/08/21 11am DATE/TIME:	Random Sample Temperature on Receipt: °C
COC Emailed: [redacted] **EDD FORMAT (or default):**	**RECEIVED BY:** [redacted] DATE/TIME: 01/09/21	Other comment:
Email Reports to (will default to PM if no other addresses are listed): [redacted]	**RELINQUISHED BY:** DATE/TIME:	**RECEIVED BY:** DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): [redacted]		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: TNT-983507529614

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	A04 Partial Dust Analysis (TIM + CM + AC) (AS 3580.10.1)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	AQ_CN	18/08/21 8:10 am	S	Dust gauge bottle - copper sulfate	1	X							
	AQ_CS	18/08/21 11:50 am	S	Dust gauge bottle - copper sulfate	1	X							
	AQ_S2	18/08/21 10:20 am	S	Dust gauge bottle - copper sulfate	1	X							
				TOTAL									

Environmental Division
Newcastle
Work Order Reference
EN2107605

Telephone : +61 2 4014 2500

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

TNT : 9835 0751 3354

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 3/1 Burma Road Pooraka SA 5095 Ph: 08 8162 5140 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 48 Calcomondah Drive Gladstone QLD 4680 Ph: 07 4976 7944 E: ALSEnviro.Gladstone@alsglobal.com

MACKAY Unit 2/30 Caterpillar Drive Paget QLD 4740 Ph: 07 4952 5795 E: ALSEnviro.Mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobe.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com

WOLLONGONG 1/19-21 Ralph Black Drive, Nth Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Bennett Resources Pty Ltd	**TURNAROUND REQUIREMENTS:** ☒ Standard TAT (List due date): By 31/10/21	**FOR LABORATORY USE ONLY (Circle)**	
OFFICE: [redacted]	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes No N/A
PROJECT: Air Quality Monitoring **PROJECT NO**	**ALS QUOTE NO.:** NE/066/21	Free ice / frozen ice bricks present upon receipt?	Yes No N/A
ORDER NUMBER: **PURCHASE ORDER NO.:**	**COUNTRY OF ORIGIN:** Australia	Random Sample Temperature on Receipt:	°C
PROJECT MANAGER: [redacted] **CONTACT PH:** [redacted]	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7	Other comment:	
SAMPLER: [redacted] **SAMPLER MOBIL** [redacted]	OP: 1 2 3 4 5 6 7		
COC Emailed to ALS? (YES / NO) **EDD FORMAT (or default):**	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
Email Reports to (will default to PM if no other addresses are listed): [redacted]	DATE/TIME: 23/09/21 15:00	DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): [redacted]	6/10/21 9:00		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	A04 Partial Dust Analysis [TIM + CM + AC] (AS 3580.10.1)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	AQ_CN	21/09/21	S	Dust gauge bottle - copper sulfate	1	X								
2	AQ_CS	21/09/21	S	Dust gauge bottle - copper sulfate	1	X								
3	AQ_S2	21/09/21	S	Dust gauge bottle - copper sulfate	1	X								
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SC = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Environmental Division
Newcastle
Work Order Reference
EN2108715

TNT.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 3/1 Burma Road Pooraka SA 5095 Ph: 08 8162 5130 E: adelaide@alsglobal.com

☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐GLADSTONE 46 Callemondah Drive Gladstone QLD 4680 Ph: 07 4971 7444 E: ALSEnviro.Gladstone@alsglobal.com

☐MACKAY Unit 2/22 Caterpillar Drive Paget QLD 4740 Ph: 07 4952 5796 E: ALSEnviro.Mackay@alsglobal.com

☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com

☐WOLLONGONG 1/18-21 Ralph Black Drive, Nth Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Bennett Resources Pty Ltd	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: [redacted]		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / No / N/A
PROJECT: Air Quality Monitoring **PROJECT NO.**	**ALS QUOTE NO.:** NE/066/21	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7	Free Ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER: **PURCHASE ORDER NO.:**	**COUNTRY OF ORIGIN:** Australia		Random Sample Temperature on Receipt: 5 °C
PROJECT MANAGER: [redacted] **CONTACT PH:** [redacted]		OF: 1 2 3 4 5 6 7	Other comment:

SAMPLER: **SAMPLER MOBILE:**	**RELINQUISHED BY:**	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
COC Emailed to ALS? (YES / NO) **EDD FORMAT (or default):**				
Email Reports to (will default to PM if no other addresses are listed): [redacted]	DATE/TIME:	DATE/TIME: 2/11/21 11:20	DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): [redacted]				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	A04 Partial Dust Analysis (TIM + CM + AC) (AS 3580.10.1)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	AQ_CN	20/10/21 0630	S	Dust gauge bottle - copper sulfate	1	X								
2	AQ_C6	20/10/21 0809	S	Dust gauge bottle - copper sulfate	1	X								
3	AQ_S2	20/10/21 0930	S	Dust gauge bottle - copper sulfate	1	X								
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; L = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Environmental Division
Newcastle
Work Order Reference
EN2109684

Telephone : +61 2 4014 2500

TNT: 9835 0751 3332.

CHAIN OF CUSTODY

ALS Laboratory, please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8162 5130 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Gladstone QLD 4680 Ph: 07 4979 9944 E: ALSEnviro.Gladstone@alsglobal.com

MACKAY Unit 2/20 Caterpillar Drive Paget QLD 4740 Ph: 07 4952 5798 E: ALSEnviro.Mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com

WOLLONGONG 1/19-21 Bolph Black Drive, Nth Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Bennett Resources Pty Ltd	**TURNAROUND REQUIREMENTS:** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):		**FOR LABORATORY USE ONLY (Circle)**
OFFICE: [redacted]			Custody Seal Intact? Yes No N/A
PROJECT: Air Quality Monitoring **PROJECT NO.**	**ALS QUOTE NO.:** NE/066/21	**COC SEQUENCE NUMBER (Circle)**	Free Ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: **PURCHASE ORDER NO.:**	**COUNTRY OF ORIGIN:** Australia	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt °C
PROJECT MANAGER: [redacted] **CONTACT PH:** [redacted]		OF: 1 2 3 4 5 6 7	Other comment:

SAMPLER: [redacted] **SAMPLER MOBILE:**	**RELINQUISHED BY:**	**RECEIVED BY:** [redacted]	**RELINQUISHED BY:**	**RECEIVED BY:**
COC Emailed to ALS? (YES / NO) **EDD FORMAT (or default):**				
Email Reports to (will default to PM if no other addresses are listed): [redacted]	DATE/TIME:	DATE/TIME: 9:15	DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): [redacted]				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED Including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	A04 Partial Dust Analysis (TIM + CM + AC) (AS 3580.10.1)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	AQ_CN	16/11/21 0720	S	Dust gauge bottle - copper sulfate	1	X								
	AQ_CS	16/11/21 0930	S	Dust gauge bottle - copper sulfate	1	X								
	AQ_S2	16/11/21 0830	S	Dust gauge bottle - copper sulfate	1	X								
				TOTAL										

Environmental Division
Newcastle
Work Order Reference
EN2110479

Telephone : +61 2 4014 2500

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; L1 = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

APPENDIX B – LABORATORY CERTIFICATES OF ANALYSIS

APPENDIX B – LABORATORY CERTIFICATES OF ANALYSIS

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2105364**	Page	: 1 of 4
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: +[redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 19-Jul-2021 09:40
Order number	: ----	Date Analysis Commenced	: 20-Jul-2021
C-O-C number	: ----	Issue Date	: 01-Sep-2021 08:41
Sampler	: [redacted]		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 5		
No. of samples analysed	: 5		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Daniel Junek	Senior Air Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP101-H: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP101-H: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP101: Results reported in µg/m³ are calculated from PPBV results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa.
- CAN-001: Results for Pressure - As Received are measured under controlled conditions using calibrated laboratory gauges. These results are expressed as an Absolute Pressure. Equivalent gauge pressures may be calculated by subtracting the Pressure - Laboratory Atmosphere taken at the time of measurement.
- CAN-001: Results for Pressure - Gauge as Received are obtained from uncalibrated field gauges and are indicative only. These results may not precisely match calibrated gauge readings and may vary from field measurements due to changes in temperature and pressure

Analytical Results

Sub-Matrix: **AIR**
(Matrix: **AIR**)

Compound	CAS Number	LOR	Unit	Sample ID	AQ_CS C12620_S1620	AQ_S2 C4984_S2848	AQ_CN C12642_S2839	AQ_S3 C12647_S2833	AQ_S1 C4781_S1830
				Sampling date / time	24-Jun-2021 09:30	24-Jun-2021 10:40	24-Jun-2021 14:30	24-Jun-2021 10:30	24-Jun-2021 12:40
					EN2105364-001	EN2105364-002	EN2105364-003	EN2105364-004	EN2105364-005
					Result	Result	Result	Result	Result
EP101: VOCs by USEPA Method TO15 (Calculated Concentration)									
Benzene	71-43-2	1.6	µg/m³		<1.6	<1.6	<1.6	----	----
Toluene	108-88-3	1.9	µg/m³		<1.9	<1.9	<1.9	----	----
Ethylbenzene	100-41-4	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	4.3	µg/m³		<4.3	<4.3	<4.3	----	----
ortho-Xylene	95-47-6	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
Naphthalene	91-20-3	2.6	µg/m³		<2.6	<2.6	<2.6	----	----
Total Xylenes	----	6.5	µg/m³		<6.5	<6.5	<6.5	----	----
EP101: VOCs by USEPA Method TO15r									
Benzene	71-43-2	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Toluene	108-88-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	ppbv		<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	1.0	ppbv		<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Total Xylenes	----	1.5	ppbv		<1.5	<1.5	<1.5	----	----
EP104: Light Hydrocarbons									
Methane	74-82-8	0.0005	Mol %		----	<0.0010	----	<0.0010	<0.0010
EP104: Light Hydrocarbons (Calc Conc)									
Methane	74-82-8	3.30	mg/m³		----	<6.60	----	<6.60	<6.60
Sampling Quality Assurance									
Pressure - As received	PRESSURE	0.1	kPaa		**99.9**	**98.0**	**95.7**	**101**	**98.9**
Pressure - Gauge as Received	----	1	Inches Hg		**-2**	**-1**	**-1**	**-1**	**1**
Pressure - Laboratory Atmosphere	----	0.1	kPaa		**100**	**100**	**100**	**100**	**100**
Temperature as Received	----	0.1	°C		**20.0**	**20.0**	**20.0**	**20.0**	**20.0**
EP101: Surrogates									
4-Bromofluorobenzene	460-00-4	0.5	%		**99.5**	**99.6**	**99.9**	----	----

Surrogate Control Limits

Sub-Matrix: **AIR**

Compound	CAS Number	Recovery Limits (%) Low	High
EP101: Surrogates			
4-Bromofluorobenzene	460-00-4	60	140

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2106972**	Page	: 1 of 4
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: [redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 10-Aug-2021 09:00
Order number	: ----	Date Analysis Commenced	: 11-Aug-2021
C-O-C number	: ----	Issue Date	: 16-Sep-2021 09:42
Sampler	: [redacted]		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 5		
No. of samples analysed	: 5		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dale Semple	Analyst	Newcastle - Organics, Mayfield West, NSW
Dale Semple	Analyst	Newcastle, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle - Organics, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP101-H: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP101-H: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP101: Results reported in µg/m³ are calculated from PPBV results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa.
- CAN-001: Results for Pressure - As Received are measured under controlled conditions using calibrated laboratory gauges. These results are expressed as an Absolute Pressure. Equivalent gauge pressures may be calculated by subtracting the Pressure - Laboratory Atmosphere taken at the time of measurement.
- CAN-001: Results for Pressure - Gauge as Received are obtained from uncalibrated field gauges and are indicative only. These results may not precisely match calibrated gauge readings and may vary from field measurements due to changes in temperature and pressure

Analytical Results

Sub-Matrix: **AIR**
(Matrix: **AIR**)

Compound	CAS Number	LOR	Unit	Sample ID	AQ_CN C40220 S15007	AQ_CS C40227 S15015	AQ_S2 C40215 S1614	AQ_S1 C40249 S15024	AQ_S3 C40214 S15018
				Sampling date / time	22-Jul-2021 10:52	22-Jul-2021 08:37	22-Jul-2021 09:16	22-Jul-2021 09:04	22-Jul-2021 10:20
					EN2106972-001	EN2106972-002	EN2106972-003	EN2106972-004	EN2106972-005
					Result	Result	Result	Result	Result
EP101: VOCs by USEPA Method TO15 (Calculated Concentration)									
Benzene	71-43-2	1.6	µg/m³		<1.6	<1.6	<1.6	----	----
Toluene	108-88-3	1.9	µg/m³		<1.9	<1.9	<1.9	----	----
Ethylbenzene	100-41-4	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	4.3	µg/m³		<4.3	<4.3	<4.3	----	----
ortho-Xylene	95-47-6	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
Naphthalene	91-20-3	2.6	µg/m³		<2.6	<2.6	<2.6	----	----
Total Xylenes	----	6.5	µg/m³		<6.5	<6.5	<6.5	----	----
EP101: VOCs by USEPA Method TO15r									
Benzene	71-43-2	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Toluene	108-88-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	ppbv		<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	1.0	ppbv		<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Total Xylenes	----	1.5	ppbv		<1.5	<1.5	<1.5	----	----
EP104: Light Hydrocarbons									
Methane	74-82-8	0.0005	Mol %		----	----	<0.0010	<0.0010	<0.0010
EP104: Light Hydrocarbons (Calc Conc)									
Methane	74-82-8	3.30	mg/m³		----	----	<6.60	<6.60	<6.60
Sampling Quality Assurance									
Pressure - As received	PRESSURE	0.1	kPaa		**85.0**	**89.7**	**96.1**	**91.1**	**101**
Pressure - Gauge as Received	----	1	Inches Hg		**-6**	**-4**	**-3**	**-7**	**-1**
Pressure - Laboratory Atmosphere	----	0.1	kPaa		**102**	**102**	**102**	**102**	**102**
Temperature as Received	----	0.1	°C		**20.0**	**20.0**	**20.0**	**20.0**	**20.0**
EP101: Surrogates									
4-Bromofluorobenzene	460-00-4	0.5	%		**104**	**104**	**104**	----	----

Surrogate Control Limits

Sub-Matrix: **AIR**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP101: Surrogates			
4-Bromofluorobenzene	460-00-4	60	140

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2108023**	Page	: 1 of 4
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: +[redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 01-Sep-2021 08:45
Order number	: ----	Date Analysis Commenced	: 16-Sep-2021
C-O-C number	: ----	Issue Date	: 18-Oct-2021 10:11
Sampler	: [redacted]		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 5		
No. of samples analysed	: 5		

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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dale Semple	Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

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Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP104: Results reported in mg/m³ are calculated from Mol% results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa
- EP104: Sample canisters were received at sub-ambient pressures and required dilution in the laboratory prior to analysis. LOR values have been adjusted accordingly.
- EP101-H: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP101-H: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP101, EP104: Particular samples were received outside of recommended ALS holding times for the analysis of BTEXN and low-level methane. Results should be scrutinised accordingly.
- EP101: Results reported in µg/m³ are calculated from PPBV results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa.
- CAN-001: Results for Pressure - As Received are measured under controlled conditions using calibrated laboratory gauges. These results are expressed as an Absolute Pressure. Equivalent gauge pressures may be calculated by subtracting the Pressure - Laboratory Atmosphere taken at the time of measurement.
- CAN-001: Results for Pressure - Gauge as Received are obtained from uncalibrated field gauges and are indicative only. These results may not precisely match calibrated gauge readings and may vary from field measurements due to changes in temperature and pressure

Analytical Results

Sub-Matrix: **AIR**
(Matrix: **AIR**)

Compound	CAS Number	LOR	Unit	Sample ID	AQ_CN C4973 S12202	AQ_CS C40211 S15007	AQ_S2 C4763 S1613	AQ_S3 C4991 S12208	AQ_S1 C40221 S1620
				Sampling date / time	18-Aug-2021 08:15	18-Aug-2021 12:44	18-Aug-2021 10:12	18-Aug-2021 11:12	18-Aug-2021 09:33
					EN2108023-001	EN2108023-002	EN2108023-003	EN2108023-004	EN2108023-005
					Result	Result	Result	Result	Result
EP101: VOCs by USEPA Method TO15 (Calculated Concentration)									
Benzene	71-43-2	1.6	µg/m³		<1.6	<1.6	<1.6	----	----
Toluene	108-88-3	1.9	µg/m³		<1.9	<1.9	<1.9	----	----
Ethylbenzene	100-41-4	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	4.3	µg/m³		<4.3	<4.3	<4.3	----	----
ortho-Xylene	95-47-6	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
Naphthalene	91-20-3	2.6	µg/m³		<2.6	<2.6	<2.6	----	----
Total Xylenes	----	6.5	µg/m³		<6.5	<6.5	<6.5	----	----
EP101: VOCs by USEPA Method TO15r									
Benzene	71-43-2	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Toluene	108-88-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	ppbv		<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	1.0	ppbv		<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Total Xylenes	----	1.5	ppbv		<1.5	<1.5	<1.5	----	----
EP104: Light Hydrocarbons									
Methane	74-82-8	0.0005	Mol %		----	----	<0.0010	<0.0010	<0.0010
EP104: Light Hydrocarbons (Calc Conc)									
Methane	74-82-8	3.30	mg/m³		----	----	<6.60	<6.60	<6.60
Sampling Quality Assurance									
Pressure - As received	PRESSURE	0.1	kPaa		**85.2**	**81.5**	**92.1**	**91.2**	**95.7**
Pressure - Gauge as Received	----	1	Inches Hg		**-4**	**-9**	**-5**	**-3**	**-3**
Pressure - Laboratory Atmosphere	----	0.1	kPaa		**101**	**102**	**101**	**102**	**101**
Temperature as Received	----	0.1	°C		**20.0**	**20.0**	**20.0**	**20.0**	**20.0**
EP101: Surrogates									
4-Bromofluorobenzene	460-00-4	0.5	%		**106**	**103**	**107**	----	----

Surrogate Control Limits

Sub-Matrix: **AIR**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP101: Surrogates			
4-Bromofluorobenzene	460-00-4	60	140

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2109362**	Page	: 1 of 4
Amendment	: **1**		
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: + [redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 22-Oct-2021 09:59
Order number	: ----	Date Analysis Commenced	: 25-Oct-2021
C-O-C number	: ----	Issue Date	: 22-Nov-2021 09:40
Sampler	: ----		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 5		
No. of samples analysed	: 5		

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- Surrogate Control Limits

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Signatories	*Position*	*Accreditation Category*
Dale Semple	Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle, Mayfield West, NSW

General Comments

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

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- EP104: Results reported in mg/m³ are calculated from Mol% results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa
- EP101-H: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP101-H: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
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- CAN-001: Results for Pressure - Gauge as Received are obtained from uncalibrated field gauges and are indicative only. These results may not precisely match calibrated gauge readings and may vary from field measurements due to changes in temperature and pressure

Analytical Results

Sub-Matrix: **AIR**
(Matrix: **AIR**)

			Sample ID	AQ_CN C12640 S15017	AQ_CS C40224 S12206	AQ_S2 C12630 S12208	AQ_S3 C4768 S15007	AQ_S1 C40251 S2849
			Sampling date / time	21-Sep-2021 14:45	21-Sep-2021 15:55	21-Sep-2021 16:30	21-Sep-2021 17:00	21-Sep-2021 16:20
Compound	CAS Number	LOR	Unit	EN2109362-001	EN2109362-002	EN2109362-003	EN2109362-004	EN2109362-005
				Result	Result	Result	Result	Result
EP101: VOCs by USEPA Method TO15 (Calculated Concentration)								
Benzene	71-43-2	1.6	µg/m³	<1.6	<1.6	<1.6	----	----
Toluene	108-88-3	1.9	µg/m³	<1.9	<1.9	<1.9	----	----
Ethylbenzene	100-41-4	2.2	µg/m³	<2.2	<2.2	<2.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	4.3	µg/m³	<4.3	<4.3	<4.3	----	----
ortho-Xylene	95-47-6	2.2	µg/m³	<2.2	<2.2	<2.2	----	----
Naphthalene	91-20-3	2.6	µg/m³	<2.6	<2.6	<2.6	----	----
Total Xylenes	----	6.5	µg/m³	<6.5	<6.5	<6.5	----	----
EP101: VOCs by USEPA Method TO15r								
Benzene	71-43-2	0.5	ppbv	<0.5	<0.5	<0.5	----	----
Toluene	108-88-3	0.5	ppbv	<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	ppbv	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	1.0	ppbv	<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	ppbv	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	0.5	ppbv	<0.5	<0.5	<0.5	----	----
Total Xylenes	----	1.5	ppbv	<1.5	<1.5	<1.5	----	----
EP104: Light Hydrocarbons								
Methane	74-82-8	0.0005	Mol %	----	----	<0.0010	<0.0010	<0.0010
EP104: Light Hydrocarbons (Calc Conc)								
Methane	74-82-8	3.30	mg/m³	----	----	<6.60	<6.60	<6.60
Sampling Quality Assurance								
Pressure - As received	PRESSURE	0.1	kPaa	**82.6**	**87.2**	**83.9**	**86.4**	**84.5**
Pressure - Gauge as Received	----	1	Inches Hg	**-5**	**-6**	**-4**	**-4**	**-6**
Pressure - Laboratory Atmosphere	----	0.1	kPaa	**101**	**101**	**102**	**101**	**102**
Temperature as Received	----	0.1	°C	**20.0**	**20.0**	**20.0**	**20.0**	**20.0**
EP101: Surrogates								
4-Bromofluorobenzene	460-00-4	0.5	%	**100**	**100**	**98.4**	----	----

Surrogate Control Limits

Sub-Matrix: **AIR**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP101: Surrogates			
4-Bromofluorobenzene	460-00-4	60	140

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2109685**	Page	: 1 of 4
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: +[redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 02-Nov-2021 11:20
Order number	: ----	Date Analysis Commenced	: 03-Nov-2021
C-O-C number	: ----	Issue Date	: 22-Nov-2021 09:40
Sampler	: ----		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 5		
No. of samples analysed	: 5		

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- Surrogate Control Limits

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Signatories

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Signatories	*Position*	*Accreditation Category*
Dale Semple	Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle, Mayfield West, NSW

General Comments

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP104: Results reported in mg/m³ are calculated from Mol% results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa
- EP104: Sample canisters were received at sub-ambient pressures and required dilution in the laboratory prior to analysis. LOR values have been adjusted accordingly.
- EP101-H: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP101-H: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP104: Sample canisters were received at low or sub-ambient pressures and required dilution in the laboratory prior to analysis. LOR values have been adjusted accordingly
- EP101: Results reported in µg/m³ are calculated from PPBV results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa.
- CAN-001: Results for Pressure - As Received are measured under controlled conditions using calibrated laboratory gauges. These results are expressed as an Absolute Pressure. Equivalent gauge pressures may be calculated by subtracting the Pressure - Laboratory Atmosphere taken at the time of measurement.
- CAN-001: Results for Pressure - Gauge as Received are obtained from uncalibrated field gauges and are indicative only. These results may not precisely match calibrated gauge readings and may vary from field measurements due to changes in temperature and pressure

Analytical Results

Sub-Matrix: **AIR**
(Matrix: **AIR**)

Compound	CAS Number	LOR	Unit	Sample ID	AQ_CN C12635 S12204	AQ_CS C4973 S1620	AQ_S2 C40205 S1613	AQ_S1 C40239 S1614	AQ_S3 C40200 S2846
				Sampling date / time	21-Oct-2021 11:00	21-Oct-2021 09:19	21-Oct-2021 10:00	21-Oct-2021 10:30	21-Oct-2021 09:45
					EN2109685-001	EN2109685-002	EN2109685-003	EN2109685-004	EN2109685-005
					Result	Result	Result	Result	Result
EP101: VOCs by USEPA Method TO15 (Calculated Concentration)									
Benzene	71-43-2	1.6	µg/m³		<1.6	<1.6	<1.6	----	----
Toluene	108-88-3	1.9	µg/m³		<1.9	<1.9	<1.9	----	----
Ethylbenzene	100-41-4	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	4.3	µg/m³		<4.3	<4.3	<4.3	----	----
ortho-Xylene	95-47-6	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
Naphthalene	91-20-3	2.6	µg/m³		<2.6	<2.6	<2.6	----	----
Total Xylenes	----	6.5	µg/m³		<6.5	<6.5	<6.5	----	----
EP101: VOCs by USEPA Method TO15r									
Benzene	71-43-2	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Toluene	108-88-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	ppbv		<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	1.0	ppbv		<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Total Xylenes	----	1.5	ppbv		<1.5	<1.5	<1.5	----	----
EP104: Light Hydrocarbons									
Methane	74-82-8	0.0005	Mol %		----	----	<0.0010	<0.0010	<0.0010
EP104: Light Hydrocarbons (Calc Conc)									
Methane	74-82-8	3.30	mg/m³		----	----	<6.60	<6.60	<6.60
Sampling Quality Assurance									
Pressure - As received	PRESSURE	0.1	kPaa		**91.5**	**83.1**	**91.9**	**92.4**	**92.2**
Pressure - Gauge as Received	----	1	Inches Hg		**-4**	**-4**	**-5**	**-4**	**-4**
Pressure - Laboratory Atmosphere	----	0.1	kPaa		**102**	**102**	**102**	**102**	**102**
Temperature as Received	----	0.1	°C		**20.0**	**20.0**	**20.0**	**20.0**	**20.0**
EP101: Surrogates									
4-Bromofluorobenzene	460-00-4	0.5	%		**95.4**	**94.9**	**94.8**	----	----

Surrogate Control Limits

Sub-Matrix: **AIR**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP101: Surrogates			
4-Bromofluorobenzene	460-00-4	60	140

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2110478**	Page	: 1 of 4
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: +[redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 26-Nov-2021 09:15
Order number	: ----	Date Analysis Commenced	: 30-Nov-2021
C-O-C number	: ----	Issue Date	: 05-Jan-2022 09:40
Sampler	: TN/SV		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 5		
No. of samples analysed	: 5		

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Daniel Junek	Senior Air Analyst	Newcastle - Organics, Mayfield West, NSW
Daniel Junek	Senior Air Analyst	Newcastle, Mayfield West, NSW

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Where moisture determination has been performed, results are reported on a dry weight basis.

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Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP104: Results reported in mg/m³ are calculated from Mol% results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa
- EP104: Sample canisters were received at sub-ambient pressures and required dilution in the laboratory prior to analysis. LOR values have been adjusted accordingly.
- EP101-H: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP101-H: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP104: Sample canisters were received at low or sub-ambient pressures and required dilution in the laboratory prior to analysis. LOR values have been adjusted accordingly
- EP101, EP104: Particular samples were received outside of recommended ALS holding times for the analysis of BTEXN and low-level methane. Results should be scrutinised accordingly.
- EP101: Results reported in µg/m³ are calculated from PPBV results based on a temperature of 25°C and atmospheric pressure of 101.3 kPa.
- CAN-001: Results for Pressure - As Received are measured under controlled conditions using calibrated laboratory gauges. These results are expressed as an Absolute Pressure. Equivalent gauge pressures may be calculated by subtracting the Pressure - Laboratory Atmosphere taken at the time of measurement.
- CAN-001: Results for Pressure - Gauge as Received are obtained from uncalibrated field gauges and are indicative only. These results may not precisely match calibrated gauge readings and may vary from field measurements due to changes in temperature and pressure

Analytical Results

Sub-Matrix: **AIR**
(Matrix: **AIR**)

Compound	CAS Number	LOR	Unit	Sample ID	AQ_CN C40217 _S833	AQ_CS C40222 _S1619	AQ_S2 C40215 _S1616	AQ_S1 C40212 _S1615	AQ_S3 C12647 _S1617
				Sampling date / time	16-Nov-2021 07:20	16-Nov-2021 09:20	16-Nov-2021 08:30	16-Nov-2021 08:00	16-Nov-2021 08:45
					EN2110478-001	EN2110478-002	EN2110478-003	EN2110478-004	EN2110478-005
					Result	Result	Result	Result	Result
EP101: VOCs by USEPA Method TO15 (Calculated Concentration)									
Benzene	71-43-2	1.6	µg/m³		<1.6	<1.6	<1.6	----	----
Toluene	108-88-3	1.9	µg/m³		<1.9	<1.9	<1.9	----	----
Ethylbenzene	100-41-4	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	4.3	µg/m³		<4.3	<4.3	<4.3	----	----
ortho-Xylene	95-47-6	2.2	µg/m³		<2.2	<2.2	<2.2	----	----
Naphthalene	91-20-3	2.6	µg/m³		<2.6	<2.6	<2.6	----	----
Total Xylenes	----	6.5	µg/m³		<6.5	<6.5	<6.5	----	----
EP101: VOCs by USEPA Method TO15r									
Benzene	71-43-2	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Toluene	108-88-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	ppbv		<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	1.0	ppbv		<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	0.5	ppbv		<0.5	<0.5	<0.5	----	----
Total Xylenes	----	1.5	ppbv		<1.5	<1.5	<1.5	----	----
EP104: Light Hydrocarbons									
Methane	74-82-8	0.0005	Mol %		----	----	<0.0010	<0.0010	<0.0010
EP104: Light Hydrocarbons (Calc Conc)									
Methane	74-82-8	3.30	mg/m³		----	----	<6.60	<6.60	<6.60
Sampling Quality Assurance									
Pressure - As received	PRESSURE	0.1	kPaa		**67.8**	**93.6**	**92.5**	**93.3**	**81.8**
Pressure - Gauge as Received	----	1	Inches Hg		**-10**	**-4**	**-4**	**-14**	**-8**
Pressure - Laboratory Atmosphere	----	0.1	kPaa		**101**	**101**	**101**	**101**	**101**
Temperature as Received	----	0.1	°C		**20.0**	**20.0**	**20.0**	**20.0**	**20.0**
EP101: Surrogates									
4-Bromofluorobenzene	460-00-4	0.5	%		**89.9**	**90.4**	**89.8**	----	----

Surrogate Control Limits

Sub-Matrix: **AIR**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP101: Surrogates			
4-Bromofluorobenzene	460-00-4	60	140

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2105415**	Page	: 1 of 2
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: +[redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 27-Jul-2021 09:00
Order number	: ----	Date Analysis Commenced	: 28-Jul-2021
C-O-C number	: ----	Issue Date	: 01-Sep-2021 08:41
Sampler	: ----		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 3		
No. of samples analysed	: 3		

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This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth as sampling data was provided by the client.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Sample ID	**AQ_CN 22/06/21 - 21/07/21**	**AQ_CS 22/06/21 - 21/07/21**	**AQ_S2 22/06/21 - 21/07/21**	**----**	**----**
				Sampling date / time	21-Jul-2021 00:00	21-Jul-2021 00:00	21-Jul-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EN2105415-001**	**EN2105415-002**	**EN2105415-003**	**--------**	**--------**
					Result	Result	Result	----	----
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.5**	**1.0**	**1.6**	**----**	**----**
Ash Content (mg)	----	1	mg		**8**	**17**	**27**	**----**	**----**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		<0.1	<0.1	**0.7**	**----**	**----**
Combustible Matter (mg)	----	1	mg		**1**	<1	**13**	**----**	**----**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.5**	**1.0**	**2.3**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg		**9**	**17**	**40**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2107605**	Page	: 1 of 2
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: + [redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 01-Sep-2021 08:45
Order number	: ----	Date Analysis Commenced	: 03-Sep-2021
C-O-C number	: ----	Issue Date	: 16-Sep-2021 09:42
Sampler	: [redacted]		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Signatories

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Signatories	*Position*	*Accreditation Category*
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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~ = Indicates an estimated value.

- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth as sampling data was provided by the client.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Sample ID	**AQ_CN 21/07/21 - 18/08/21**	**AQ_CS 21/07/21 - 18/08/21**	**AQ_S2 21/07/21 - 18/08/21**	**----**	**----**
				Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EN2107605-001**	**EN2107605-002**	**EN2107605-003**	**--------**	**--------**
					Result	Result	Result	----	----
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.2**	**2.0**	**1.2**	**----**	**----**
Ash Content (mg)	----	1	mg		**3**	**33**	**20**	**----**	**----**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		<0.1	**0.3**	**0.1**	**----**	**----**
Combustible Matter (mg)	----	1	mg		<1	**5**	**2**	**----**	**----**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.2**	**2.3**	**1.3**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg		**3**	**38**	**22**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2108715**	Page	: 1 of 2
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: [redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 06-Oct-2021 09:00
Order number	: ----	Date Analysis Commenced	: 07-Oct-2021
C-O-C number	: ----	Issue Date	: 18-Oct-2021 10:11
Sampler	: [redacted]		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Signatories

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Signatories	*Position*	*Accreditation Category*
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation is not held for results reported in g/m².mth as sampling data was provided by he client.
- Sample exposure period is 34 days which is outside the typical exposure period of 30 +/- 2 days as per AS3580.10.1.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Sample ID	**AQ_CN 18/08/21 - 21/09/21**	**AQ_CS 18/08/21 - 21/09/21**	**AQ_S2 18/08/21 - 21/09/21**	**----**	**----**
				Sampling date / time	21-Sep-2021 00:00	21-Sep-2021 00:00	21-Sep-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EN2108715-001**	**EN2108715-002**	**EN2108715-003**	**--------**	**--------**
					Result	Result	Result	----	----
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**2.2**	**3.2**	**0.9**	**----**	**----**
Ash Content (mg)	----	1	mg		**44**	**65**	**18**	**----**	**----**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**1.2**	**0.8**	**0.1**	**----**	**----**
Combustible Matter (mg)	----	1	mg		**25**	**15**	**3**	**----**	**----**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**3.4**	**4.0**	**1.0**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg		**69**	**80**	**21**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2109684**	Page	: 1 of 2
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: +[redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 02-Nov-2021 11:20
Order number	: ----	Date Analysis Commenced	: 03-Nov-2021
C-O-C number	: ----	Issue Date	: 22-Nov-2021 09:40
Sampler	: ----		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 3		
No. of samples analysed	: 3		

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- Analytical Results

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Signatories

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Signatories	*Position*	*Accreditation Category*
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation is not held for results reported in g/m².mth as sampling data was provided by he client.

Analytical Results

Sub-Matrix: **DUST** (Matrix: **AIR**)				Sample ID	**AQ_CN 21/09/21 - 20/10/21**	**AQ_CS 21/09/21 - 20/10/21**	**AQ_S2 21/09/21 - 20/10/21**	**----**	**----**
				Sampling date / time	20-Oct-2021 06:30	20-Oct-2021 08:09	20-Oct-2021 09:30	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EN2109684-001**	**EN2109684-002**	**EN2109684-003**	**--------**	**--------**
					Result	Result	Result	----	----
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.5**	**2.1**	**0.9**	**----**	**----**
Ash Content (mg)	----	1	mg		**9**	**36**	**16**	**----**	**----**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**0.1**	**0.1**	<0.1	**----**	**----**
Combustible Matter (mg)	----	1	mg		**1**	**1**	<1	**----**	**----**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.6**	**2.2**	**0.9**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg		**10**	**37**	**16**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2110479**	Page	: 1 of 2
Client	: **Bennett Resources PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: [redacted]y	Contact	: Hayley Withers
Address	: [redacted]	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: ----	Telephone	: +[redacted]
Project	: Air Quality Monitoring	Date Samples Received	: 26-Nov-2021 09:15
Order number	: ----	Date Analysis Commenced	: 30-Nov-2021
C-O-C number	: ----	Issue Date	: 07-Dec-2021 17:18
Sampler	: [redacted]		
Site	: ----		
Quote number	: NE/066/21		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Signatories	*Position*	*Accreditation Category*
Jennifer Targett	Quality Coordinator	Newcastle - Inorganics, Mayfield West, NSW

General Comments

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LOR = Limit of reporting
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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth as sampling data was provided by the client.
- Sample exposure period is 27 days which is outside the typical exposure period of 30 +/- 2 days as per AS3580.10.1.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Sample ID	**AQ_CN 20/10/21-16/11/21**	**AQ_CS 20/10/21-16/11/21**	**AQ_S2 20/10/21-16/11/21**	**----**	**----**
				Sampling date / time	16-Nov-2021 00:00	16-Nov-2021 00:00	16-Nov-2021 00:00	----	----
Compound	CAS Number	LOR	Unit		**EN2110479-001**	**EN2110479-002**	**EN2110479-003**	**--------**	**--------**
					Result	Result	Result	----	----
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.9**	**19.9**	**2.1**	**----**	**----**
Ash Content (mg)	----	1	mg		**15**	**317**	**33**	**----**	**----**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		<0.1	**1.6**	**0.2**	**----**	**----**
Combustible Matter (mg)	----	1	mg		<1	**25**	**3**	**----**	**----**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.9**	**21.5**	**2.3**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg		**15**	**342**	**36**	**----**	**----**

Bi-Monthly Air Quality Reports 2022 [BEN397]

May-June 2022

BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
May 2022 - June 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-05-03	NA	NA	54.2	54.2
2022-05-04	2.4	16.6	100.0	100.0
2022-05-05	1.2	11.8	100.0	100.0
2022-05-06	3.0	16.0	100.0	100.0
2022-05-07	1.1	5.3	100.0	100.0
2022-05-08	1.1	7.2	100.0	100.0
2022-05-09	0.9	6.3	100.0	100.0
2022-05-10	1.2	12.1	100.0	100.0
2022-05-11	1.7	14.1	100.0	100.0
2022-05-12	9.7	110.6	100.0	100.0
2022-05-13	7.7	75.5	95.8	95.8
2022-05-14	3.0	23.4	100.0	100.0
2022-05-15	2.5	25.7	100.0	100.0
2022-05-16	6.6	74.0	100.0	100.0
2022-05-17	7.8	77.8	100.0	100.0
2022-05-18	6.8	64.6	100.0	100.0
2022-05-19	1.2	11.8	100.0	100.0
2022-05-20	1.3	12.5	95.8	95.8
2022-05-21	6.1	85.8	95.8	95.8
2022-05-22	1.4	14.4	95.8	95.8
2022-05-23	1.3	12.9	95.8	95.8
2022-05-24	2.2	15.5	100.0	100.0
2022-05-25	2.2	17.4	100.0	100.0
2022-05-26	8.2	62.4	100.0	100.0
2022-05-27	13.9	138.9	100.0	100.0
2022-05-28	4.2	26.4	100.0	100.0
2022-05-29	4.1	39.4	95.8	95.8
2022-05-30	2.4	21.6	100.0	100.0
2022-05-31	2.0	11.2	100.0	100.0
2022-06-01	1.2	5.5	95.8	95.8
2022-06-02	1.1	4.4	87.5	87.5
2022-06-03	0.7	2.2	100.0	100.0
2022-06-04	0.4	4.9	100.0	100.0
2022-06-05	1.0	14.4	100.0	100.0
2022-06-06	0.3	6.8	95.8	95.8
2022-06-07	3.3	25.3	100.0	100.0
2022-06-08	1.5	10.3	100.0	100.0
2022-06-09	2.3	8.7	95.8	95.8
2022-06-10	1.1	7.7	100.0	100.0
2022-06-11	1.1	7.9	100.0	100.0
2022-06-12	6.2	172.6	100.0	100.0
2022-06-13	2.7	33.7	100.0	100.0
2022-06-14	3.4	50.2	100.0	100.0
2022-06-15	3.5	39.5	95.8	95.8
2022-06-16	1.0	11.9	100.0	100.0

(continued)

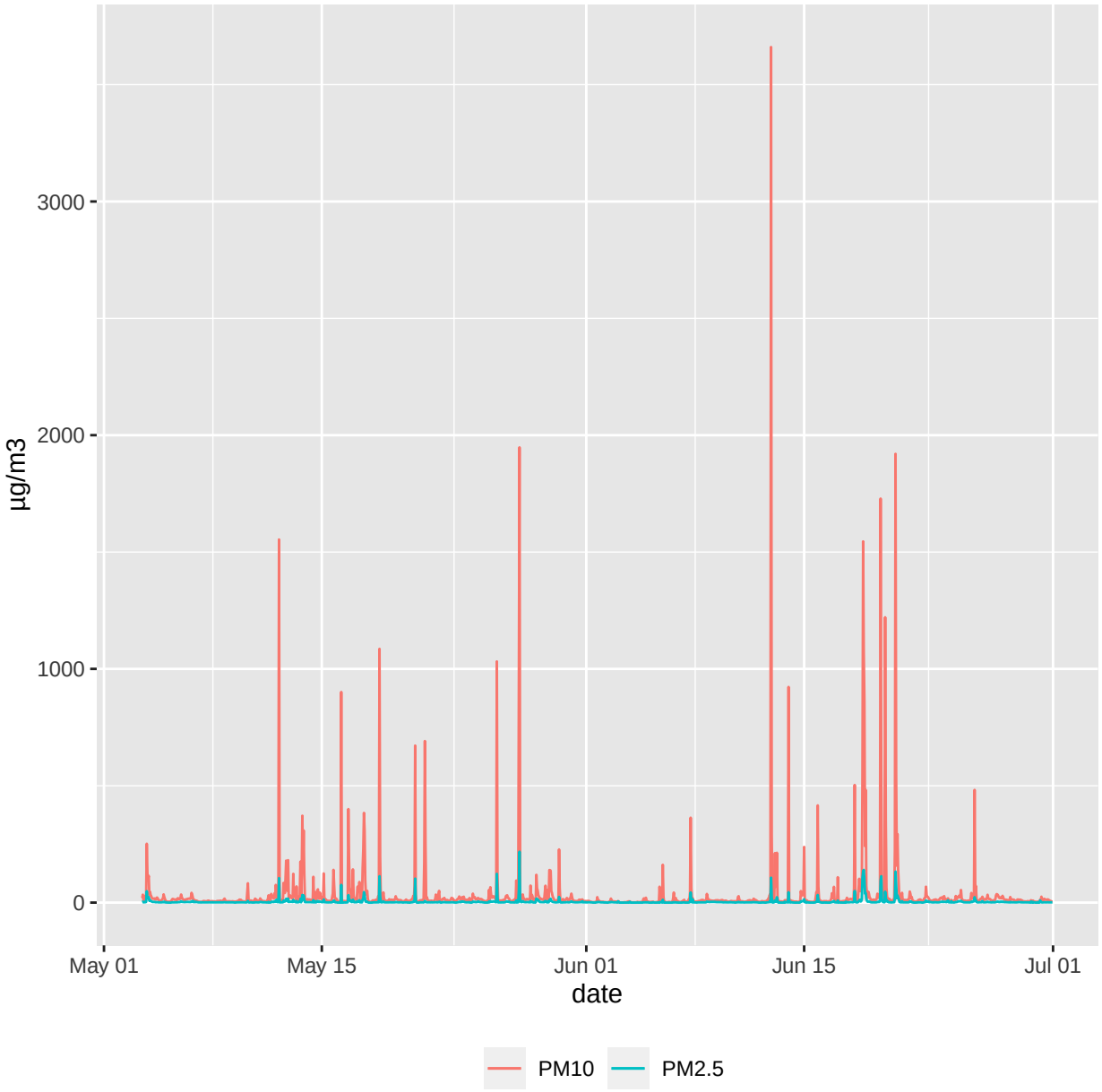
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-06-17	1.1	12.7	95.8	95.8
2022-06-18	28.5	244.5	100.0	100.0
2022-06-19	13.5	136.5	83.3	83.3
2022-06-20	15.9	207.3	95.8	95.8
2022-06-21	4.7	35.7	100.0	100.0
2022-06-22	1.5	13.9	95.8	95.8
2022-06-23	1.8	12.5	91.7	91.7
2022-06-24	3.0	14.3	100.0	100.0
2022-06-25	3.7	36.2	100.0	100.0
2022-06-26	2.4	18.3	100.0	100.0
2022-06-27	2.4	18.5	100.0	100.0
2022-06-28	1.5	11.5	100.0	100.0
2022-06-29	1.0	5.5	100.0	100.0
2022-06-30	1.5	9.5	91.7	91.7

Monthly Average

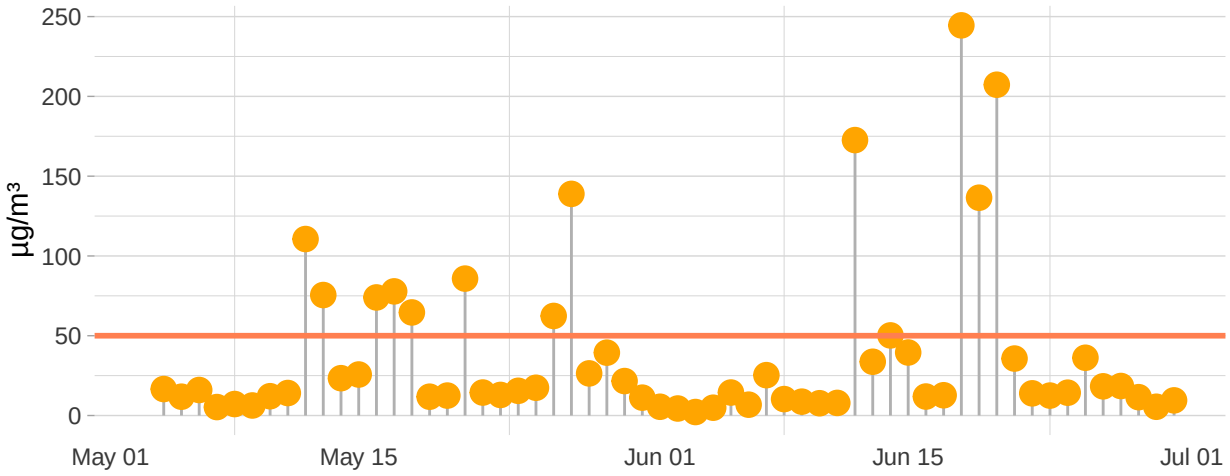
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
May 2022	3.828571	36.11429	97.55172	97.55172
June 2022	3.776667	39.43000	97.49333	97.49333

NA - Not enough data to calculate averages

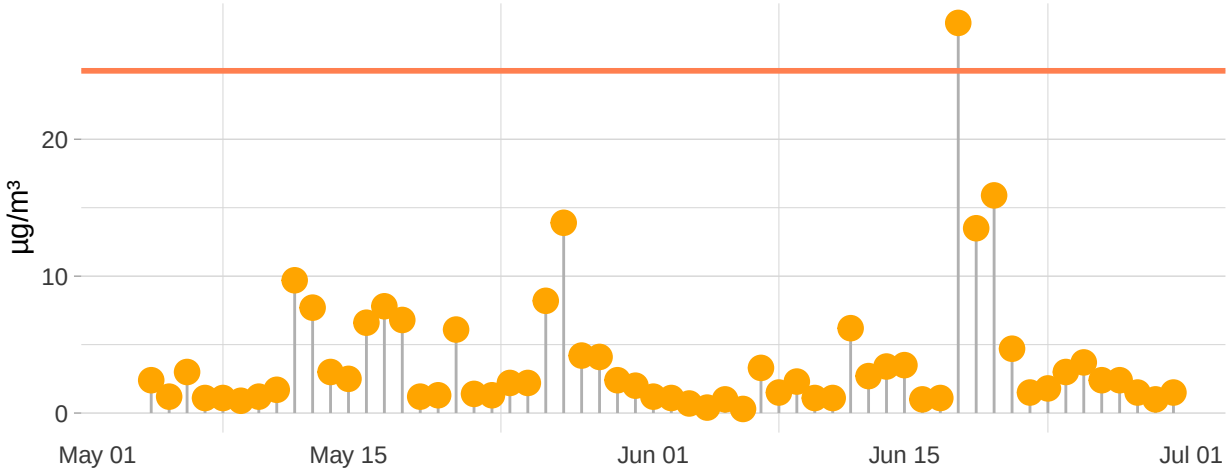
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

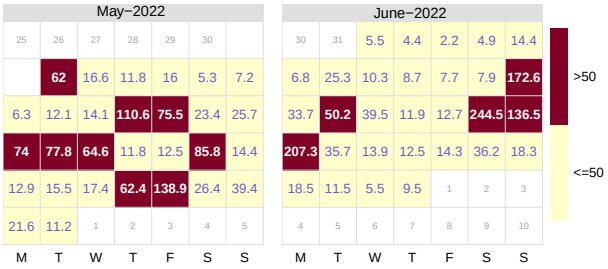


BENNETT RESOURCES

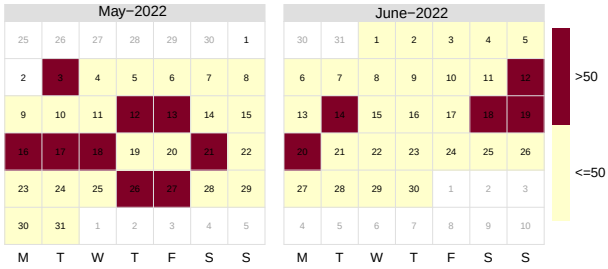
SITE: Ben397
Bi-Monthly Report
May 2022 - June 2022

Daily Exceedances

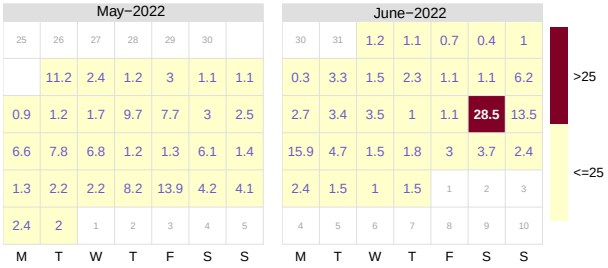
PM$_{10}$. Daily Exceedances at Ben397



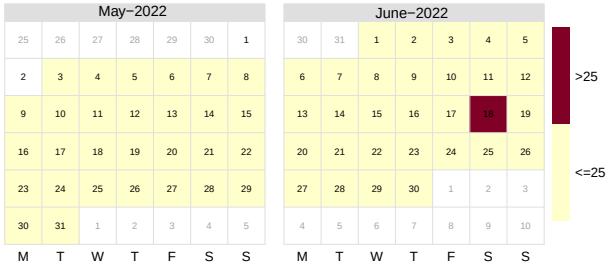
PM$_{10}$. Days with Exceedances at Ben397



PM$_{2.5}$. Daily Exceedances at Ben397



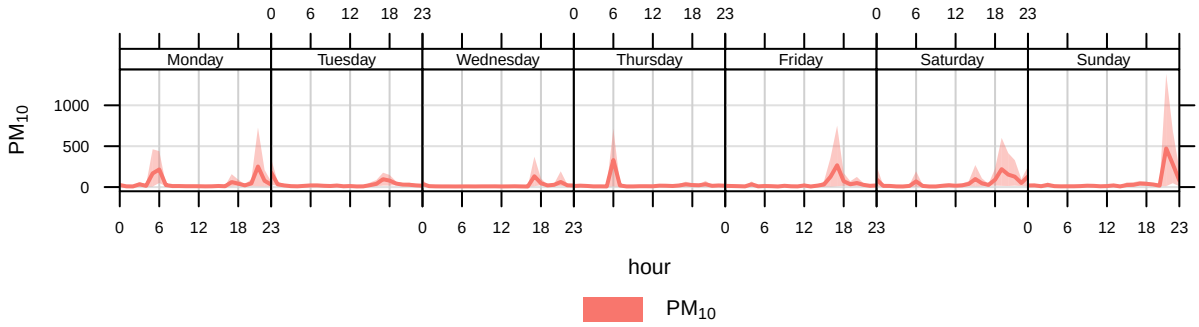
PM$_{2.5}$. Days with Exceedances at Ben397

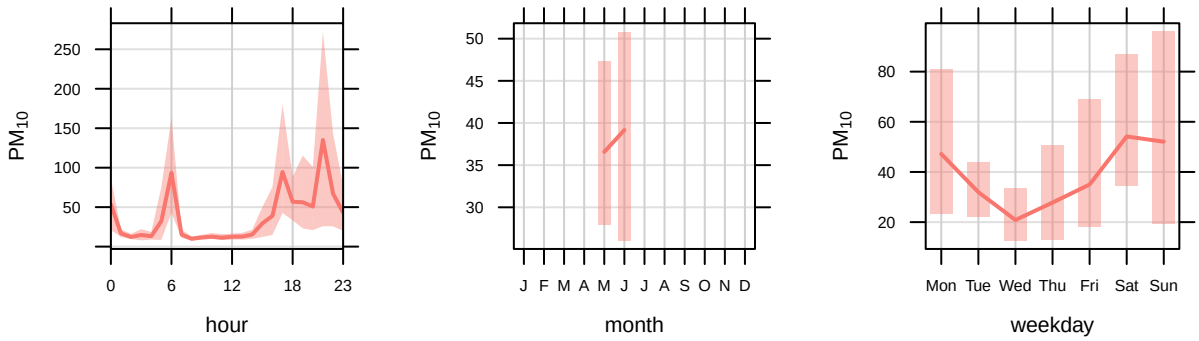


BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
May 2022 - June 2022

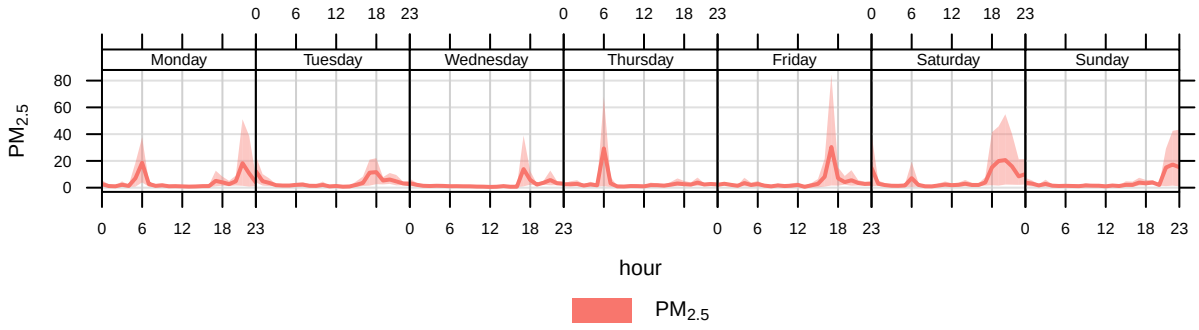
PM_{10} Time variation at Ben397

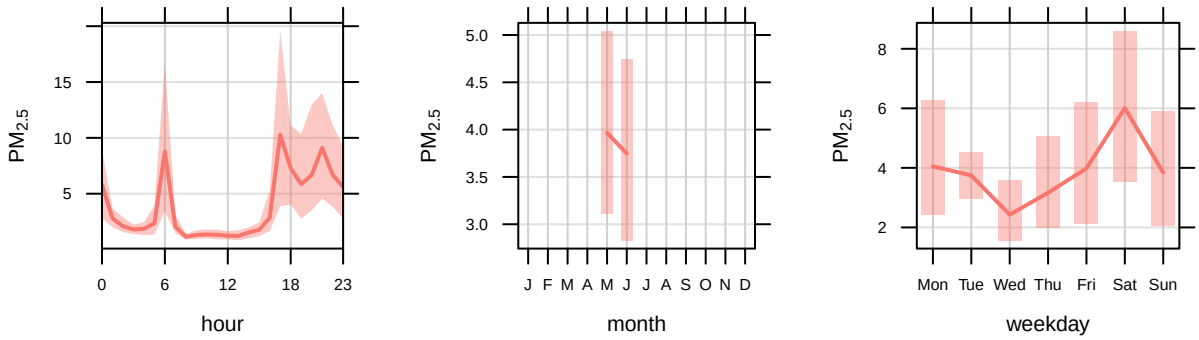




mean and 95% confidence interval in mean

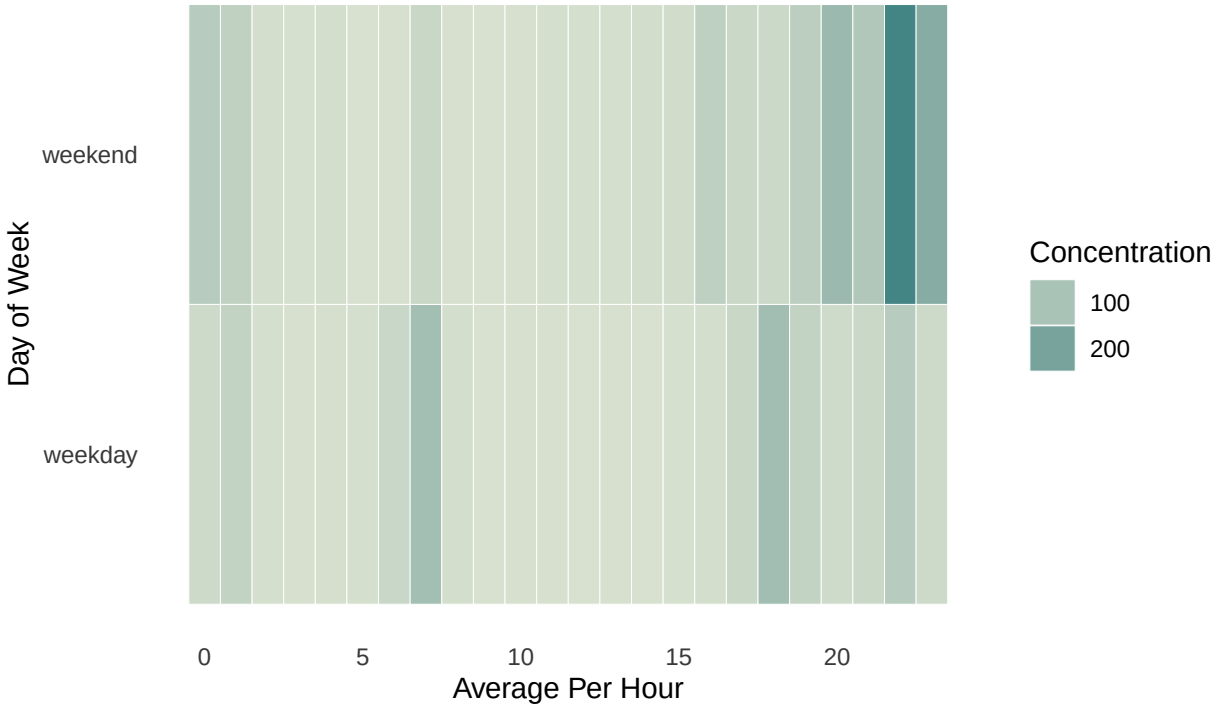
$PM_{2.5}$ Time variation at Ben397



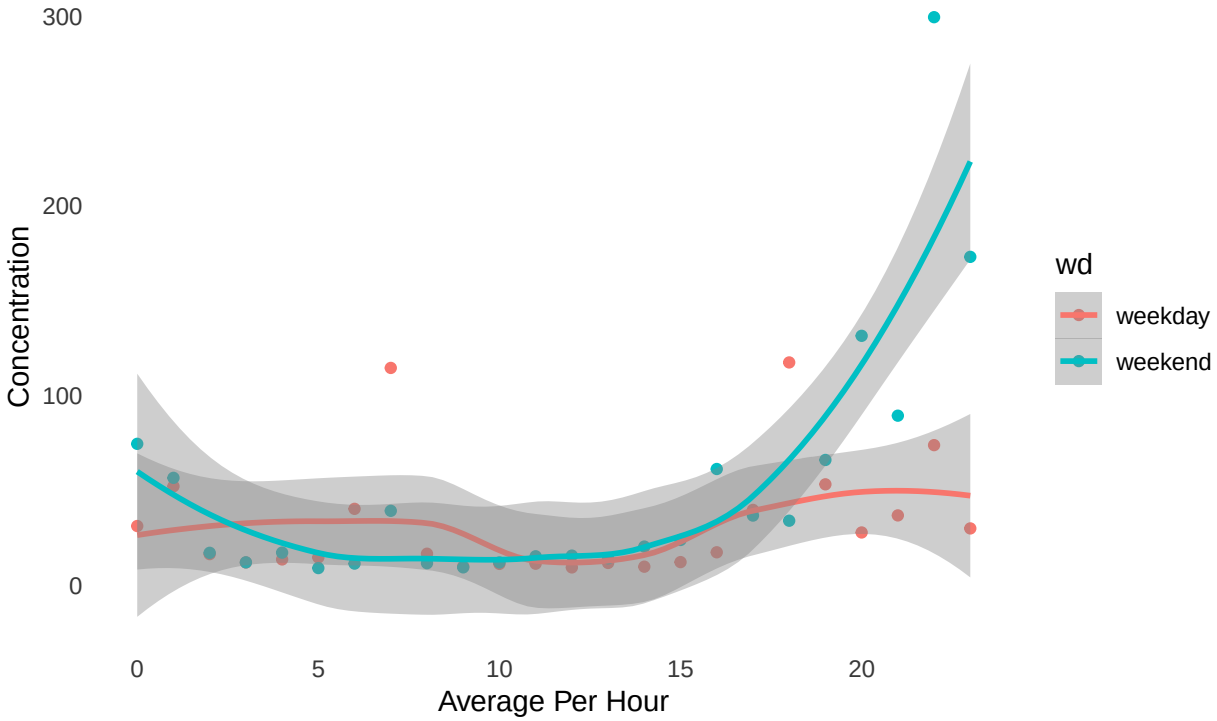


mean and 95% confidence interval in mean

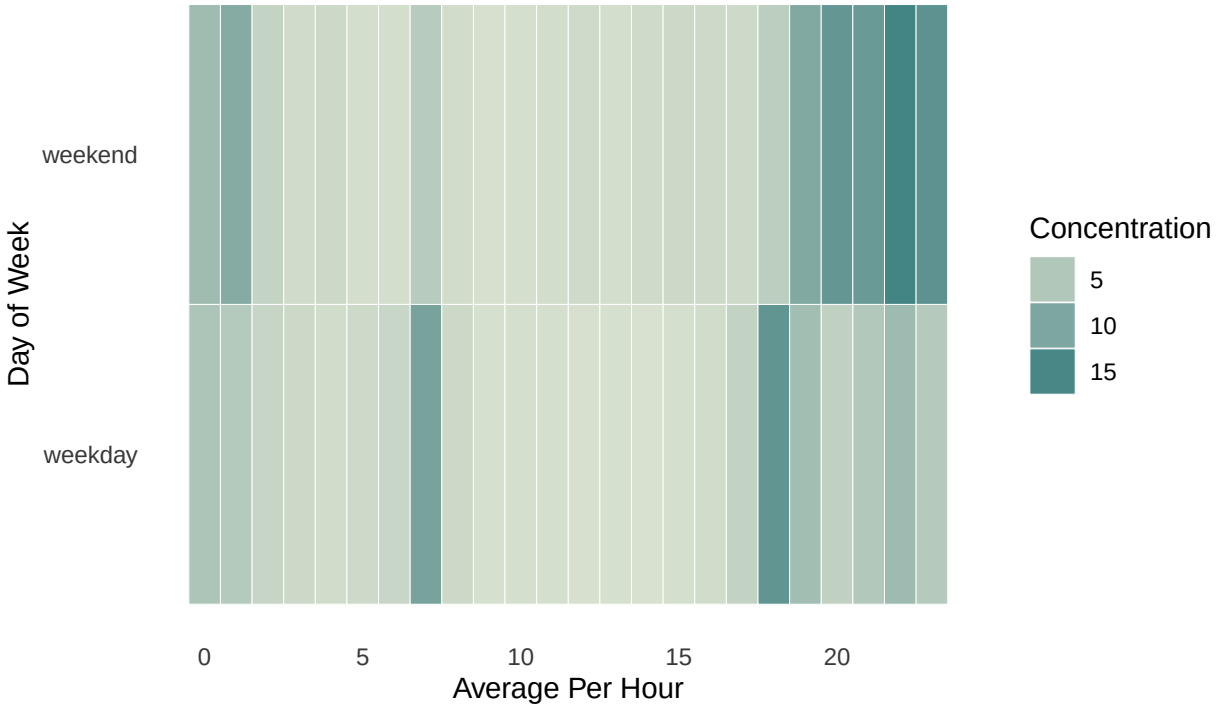
PM10 concentration by Weekday/weekend and Hour



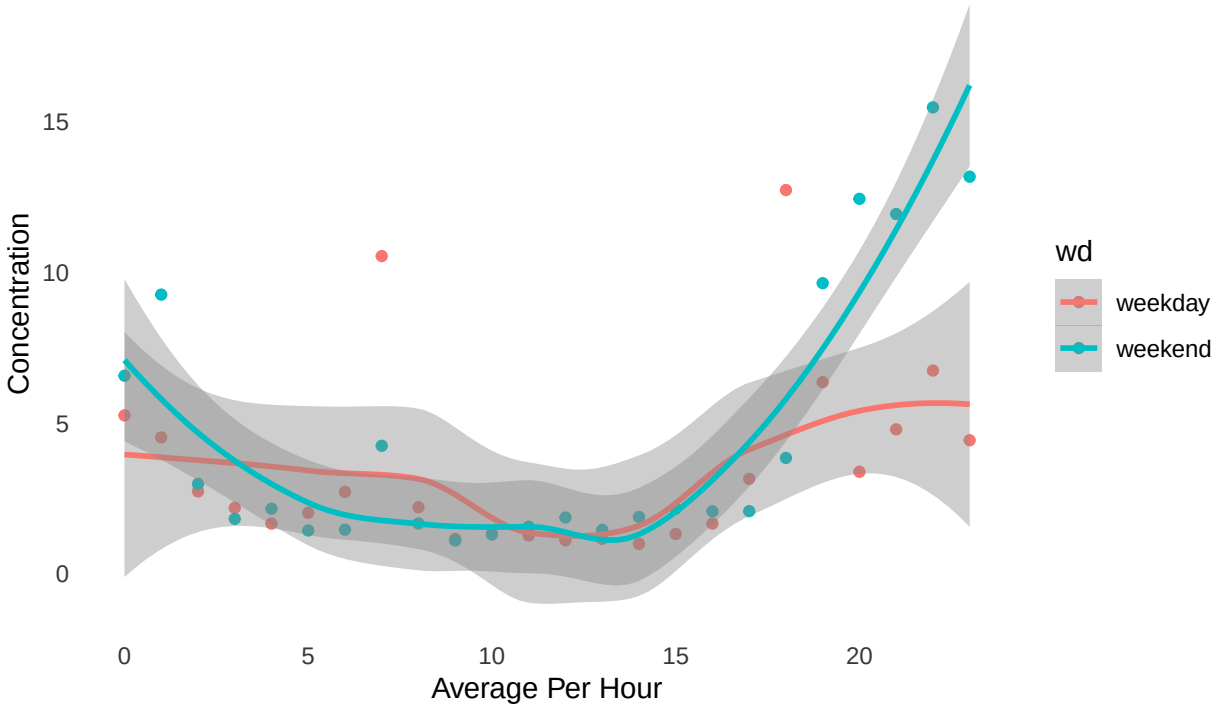
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN397]

July-August 2022

BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
July 2022 - August 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-07-01	2.0	13.5	100.0	100.0
2022-07-02	2.0	14.2	100.0	100.0
2022-07-03	1.9	14.2	100.0	100.0
2022-07-04	1.4	8.9	100.0	100.0
2022-07-05	2.2	16.9	100.0	100.0
2022-07-06	5.1	56.8	100.0	100.0
2022-07-07	17.6	165.2	100.0	100.0
2022-07-08	7.9	56.8	87.5	87.5
2022-07-09	4.4	36.2	95.8	95.8
2022-07-10	2.0	12.4	95.8	95.8
2022-07-11	6.0	44.5	91.7	91.7
2022-07-12	2.5	11.7	87.5	87.5
2022-07-13	3.3	27.4	91.7	91.7
2022-07-14	3.1	28.1	91.7	91.7
2022-07-15	4.0	34.5	95.8	95.8
2022-07-16	3.2	21.6	100.0	100.0
2022-07-17	12.2	75.9	95.8	95.8
2022-07-18	26.8	206.9	100.0	100.0
2022-07-19	21.2	244.8	95.8	95.8
2022-07-20	12.6	77.4	91.7	91.7
2022-07-21	26.5	304.0	95.8	95.8
2022-07-22	8.4	81.1	100.0	100.0
2022-07-23	22.2	202.9	100.0	100.0
2022-07-24	15.4	109.7	95.8	95.8
2022-07-25	4.5	40.4	91.7	91.7
2022-07-26	1.6	11.1	100.0	100.0
2022-07-27	2.4	17.3	83.3	83.3
2022-07-28	1.7	9.4	91.7	91.7
2022-07-29	4.8	26.0	100.0	100.0
2022-07-30	34.9	350.2	100.0	100.0
2022-07-31	21.1	177.7	95.8	95.8
2022-08-01	14.5	205.8	95.8	95.8
2022-08-02	12.6	160.3	100.0	100.0
2022-08-03	13.4	170.1	91.7	91.7
2022-08-04	14.4	148.3	91.7	91.7
2022-08-05	3.7	18.2	95.8	95.8
2022-08-06	2.8	15.4	100.0	100.0
2022-08-07	16.1	125.3	100.0	100.0
2022-08-08	11.1	103.7	91.7	91.7
2022-08-09	19.8	228.3	100.0	100.0
2022-08-10	3.8	25.9	100.0	100.0
2022-08-11	1.7	13.1	100.0	100.0
2022-08-12	1.3	11.8	95.8	95.8
2022-08-13	4.5	30.3	100.0	100.0
2022-08-14	3.1	21.6	91.7	91.7

(continued)

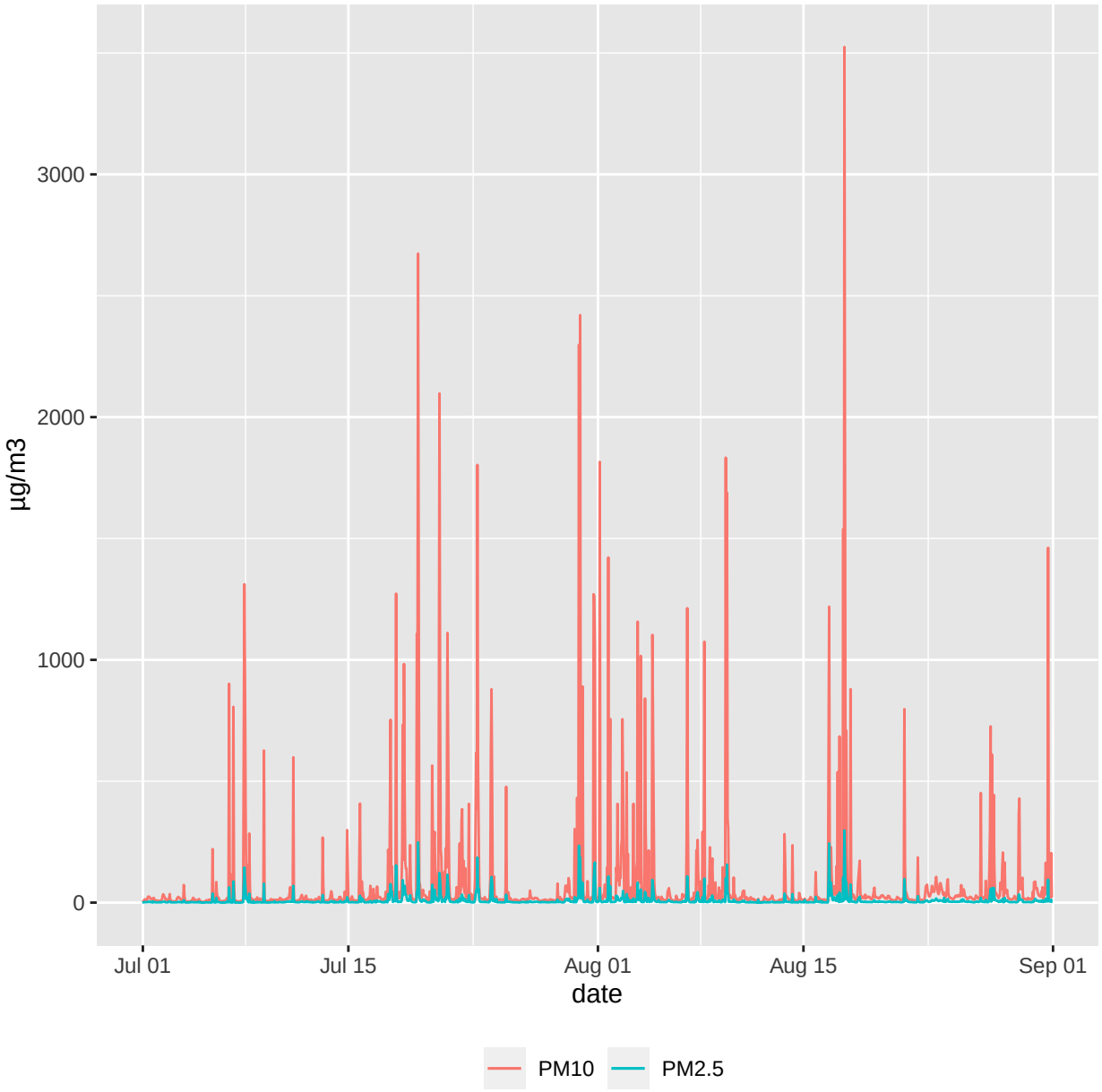
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-08-15	3.2	18.3	100.0	100.0
2022-08-16	25.9	116.5	95.8	95.8
2022-08-17	33.6	353.2	95.8	95.8
2022-08-18	9.1	76.7	91.7	91.7
2022-08-19	3.1	23.8	95.8	95.8
2022-08-20	3.3	21.6	100.0	100.0
2022-08-21	8.1	52.8	100.0	100.0
2022-08-22	4.1	22.8	100.0	100.0
2022-08-23	5.3	35.5	95.8	95.8
2022-08-24	8.3	52.4	100.0	100.0
2022-08-25	4.9	30.0	95.8	95.8
2022-08-26	2.9	18.9	91.7	91.7
2022-08-27	14.6	145.7	100.0	100.0
2022-08-28	8.4	60.6	91.7	91.7
2022-08-29	6.2	60.5	87.5	87.5
2022-08-30	4.4	30.5	100.0	100.0
2022-08-31	9.8	109.0	100.0	100.0

Monthly Average

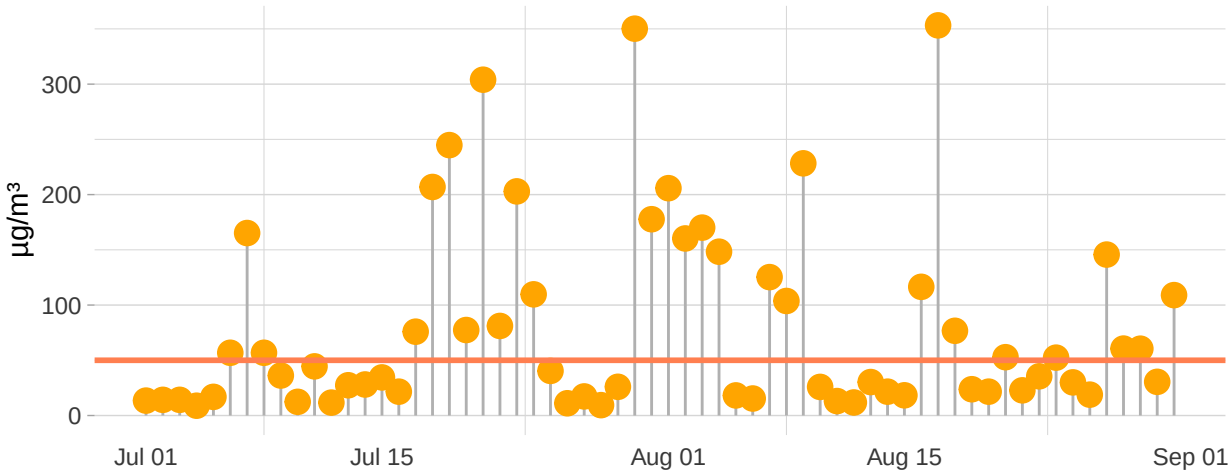
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
July 2022	9.190323	80.57097	95.96452	95.96452
August 2022	8.967742	80.86774	96.63871	96.63871

NA - Not enough data to calculate averages

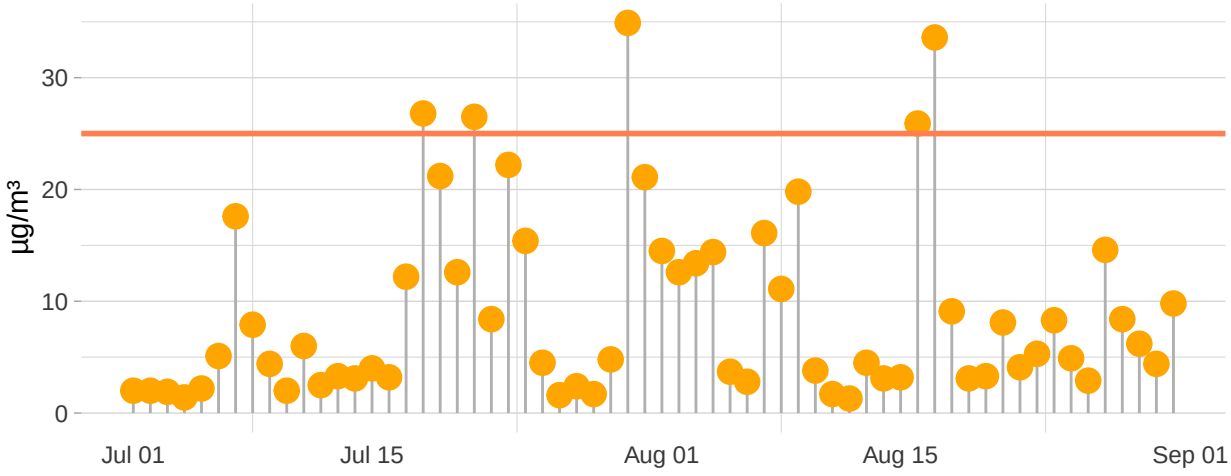
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

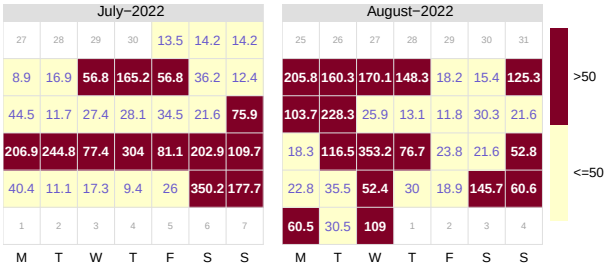


BENNETT RESOURCES

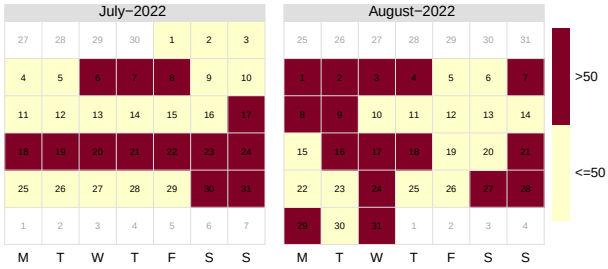
SITE: Ben397
Bi-Monthly Report
July 2022 - August 2022

Daily Exceedances

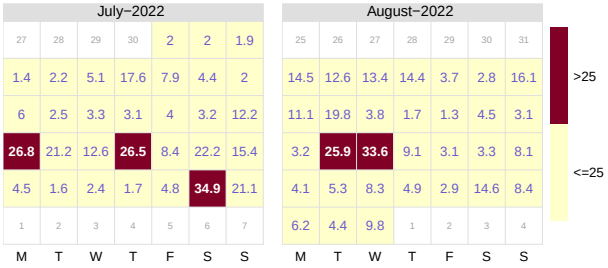
PM_{10}. Daily Exceedances at Ben397



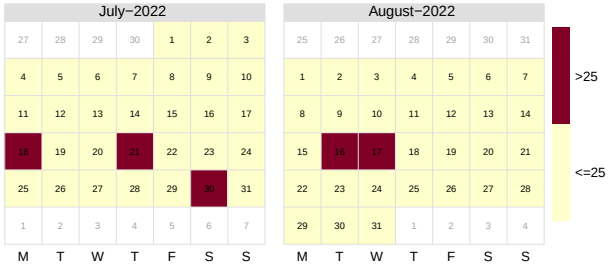
PM_{10}. Days with Exceedances at Ben397



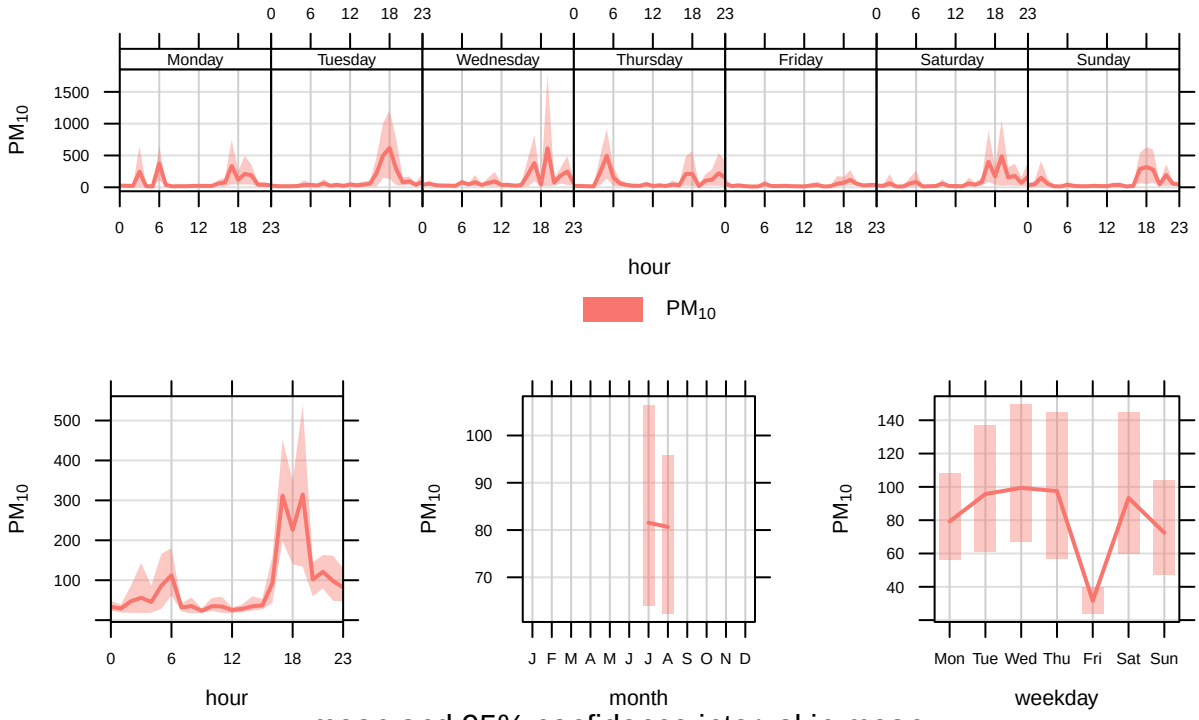
$PM_{2.5}$. Daily Exceedances at Ben397



$PM_{2.5}$. Days with Exceedances at Ben397

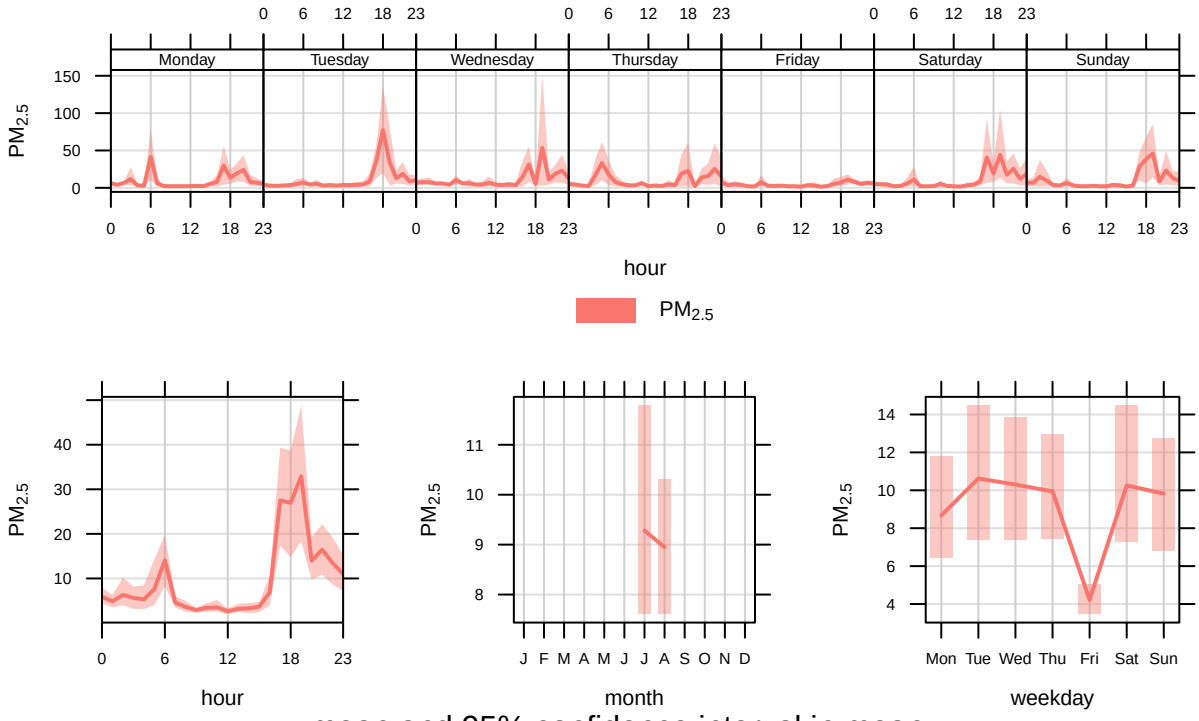


PM_{10} Time variation at Ben397



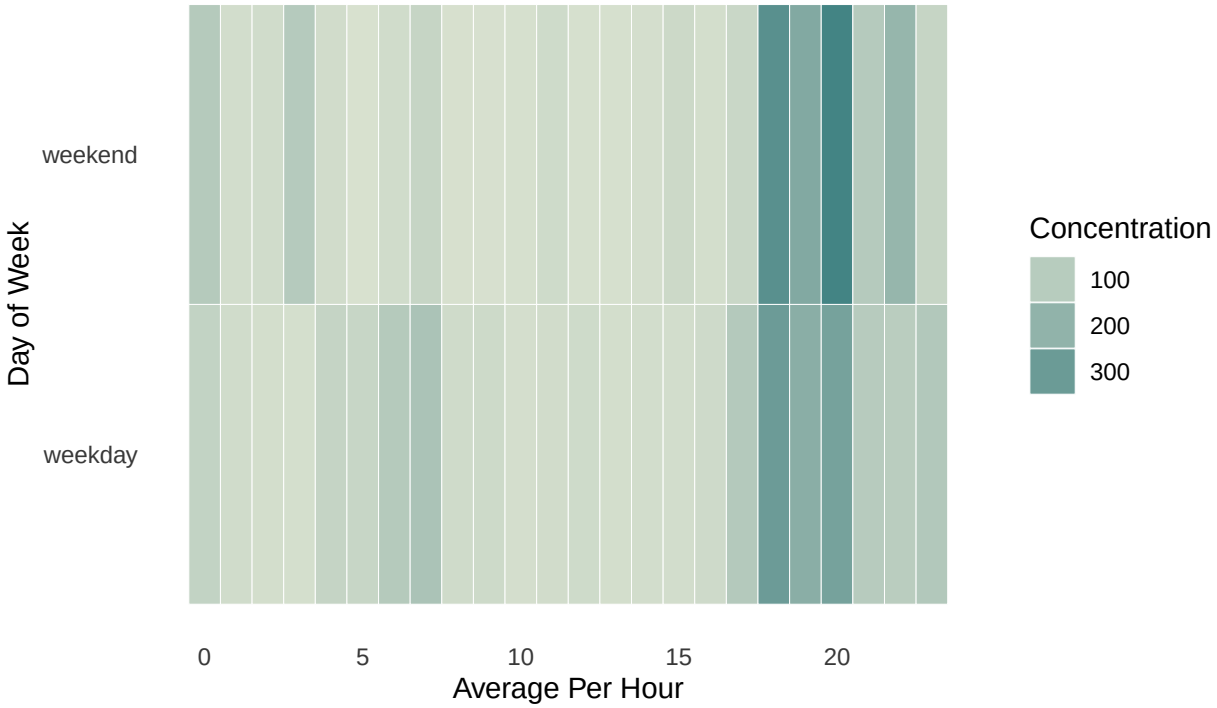
mean and 95% confidence interval in mean

$PM_{2.5}$ Time variation at Ben397

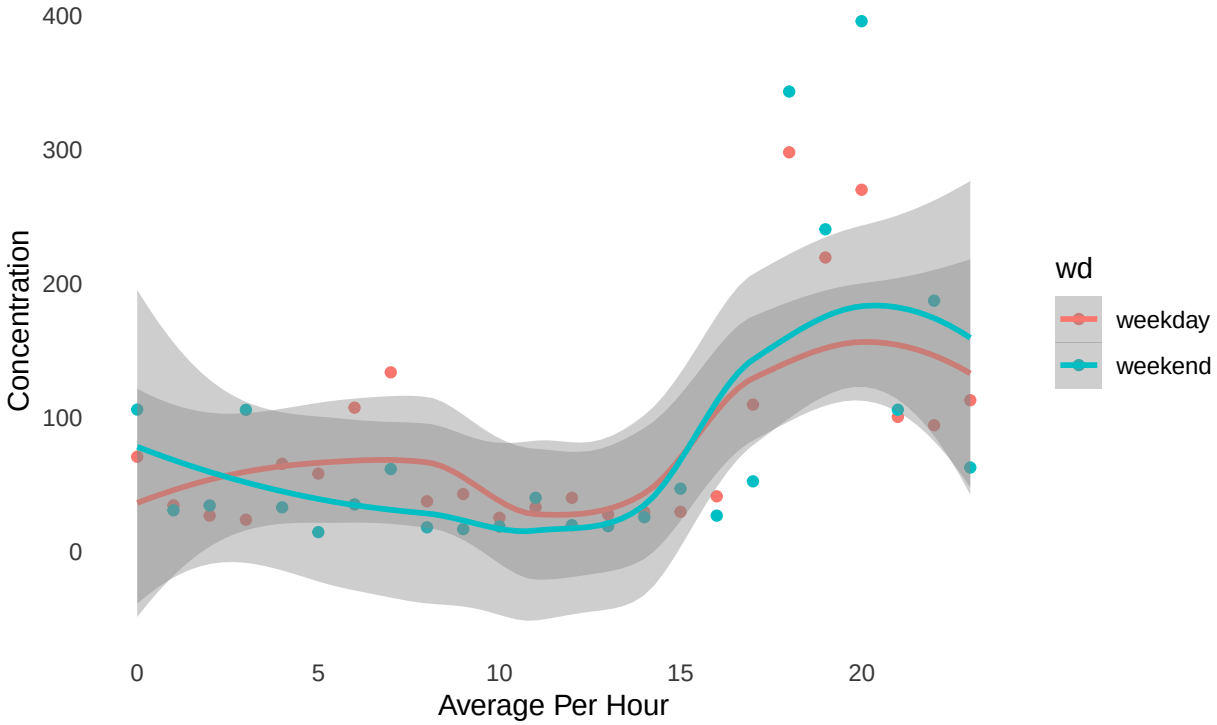


mean and 95% confidence interval in mean

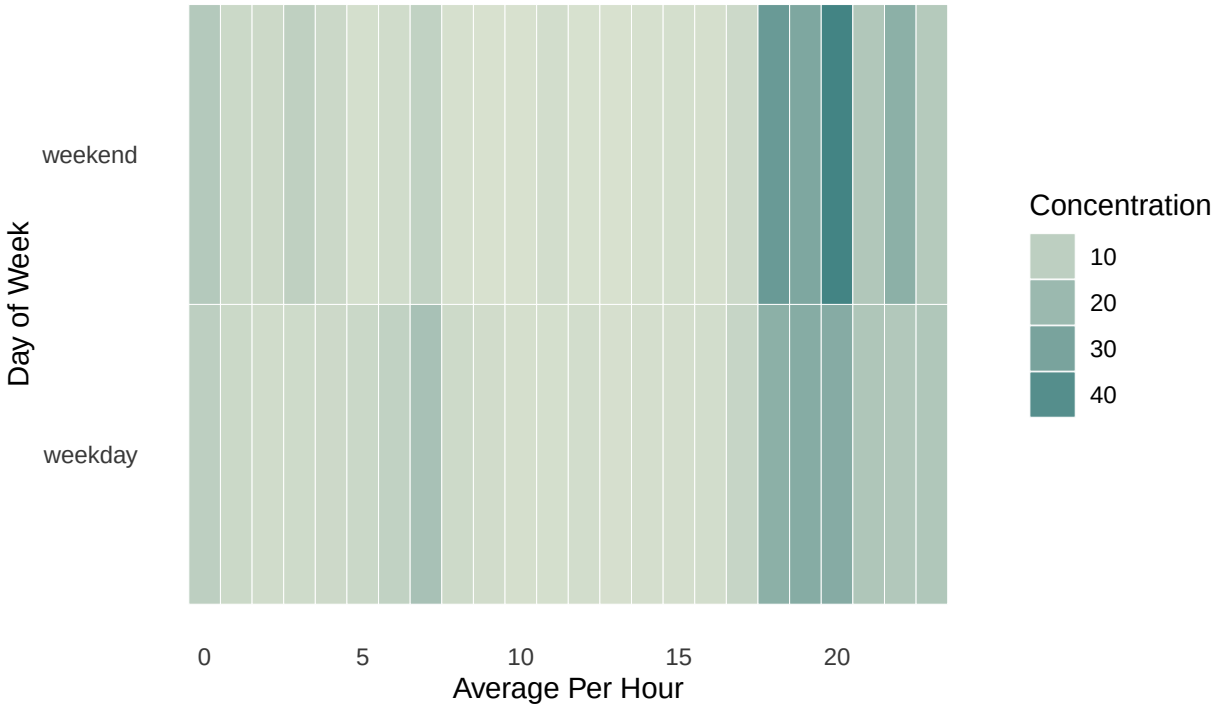
PM10 concentration by Weekday/weekend and Hour



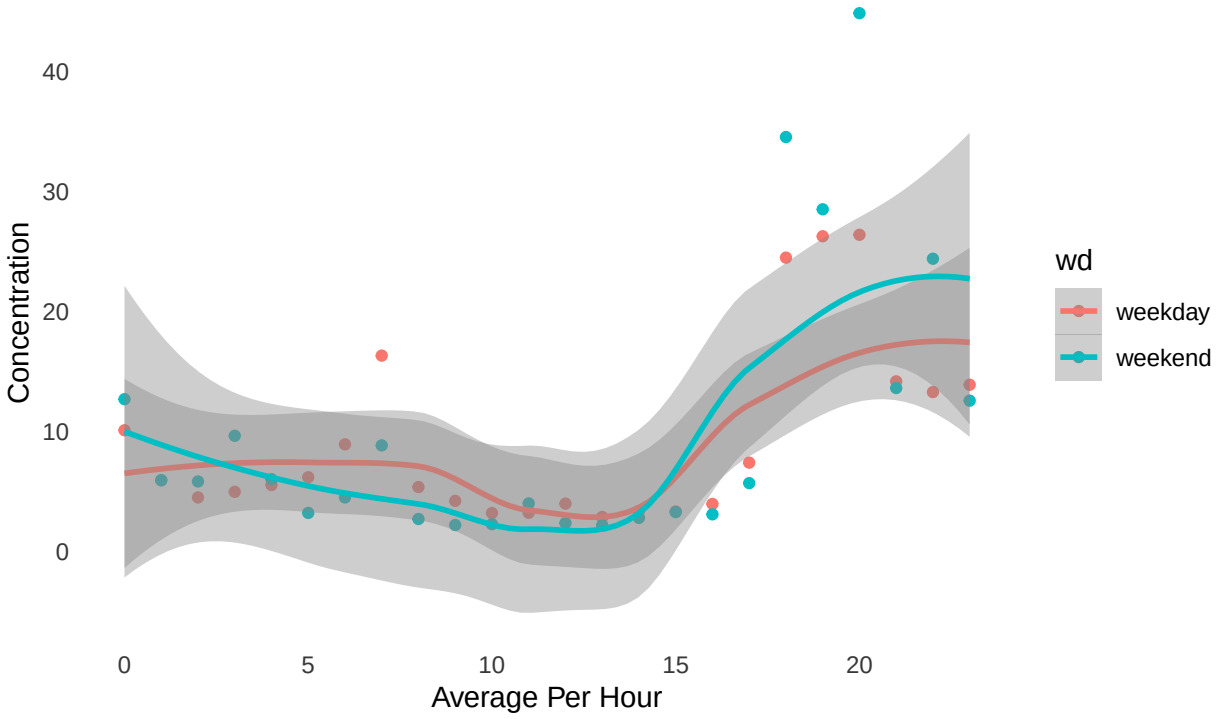
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN397]

September-October 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-09-01	3.3	20.8	100.0	100.0
2022-09-02	1.9	11.3	100.0	100.0
2022-09-03	8.2	100.0	100.0	100.0
2022-09-04	11.1	91.5	95.8	95.8
2022-09-05	8.1	57.3	100.0	100.0
2022-09-06	11.4	117.2	100.0	100.0
2022-09-07	4.9	29.9	100.0	100.0
2022-09-08	17.3	153.9	100.0	100.0
2022-09-09	7.5	60.9	100.0	100.0
2022-09-10	12.7	118.1	95.8	95.8
2022-09-11	8.0	62.5	91.7	91.7
2022-09-12	12.2	95.6	100.0	100.0
2022-09-13	11.8	117.3	95.8	95.8
2022-09-14	6.9	55.4	100.0	100.0
2022-09-15	3.3	21.1	100.0	100.0
2022-09-16	2.1	12.3	100.0	100.0
2022-09-17	10.5	95.4	100.0	100.0
2022-09-18	13.8	157.8	100.0	100.0
2022-09-19	8.8	77.5	100.0	100.0
2022-09-20	5.9	34.4	95.8	95.8
2022-09-21	4.4	27.9	95.8	95.8
2022-09-22	17.5	152.7	95.8	95.8
2022-09-23	13.8	81.2	100.0	100.0
2022-09-24	22.4	175.6	95.8	95.8
2022-09-25	13.2	102.2	95.8	95.8
2022-09-26	4.3	30.9	95.8	95.8
2022-09-27	3.4	23.8	100.0	100.0
2022-09-28	9.6	65.9	87.5	87.5
2022-09-29	8.7	90.3	95.8	95.8
2022-09-30	NA	NA	NA	NA
2022-10-01	NA	NA	NA	NA
2022-10-02	NA	NA	NA	NA
2022-10-03	3.0	8.8	100.0	100.0
2022-10-04	2.7	10.4	100.0	100.0
2022-10-05	3.4	13.4	91.7	91.7
2022-10-06	2.5	12.4	100.0	100.0
2022-10-07	2.4	16.1	100.0	100.0
2022-10-08	2.6	18.2	100.0	100.0
2022-10-09	3.0	30.9	100.0	100.0
2022-10-10	7.1	56.9	100.0	100.0
2022-10-11	3.5	31.8	95.8	95.8
2022-10-12	8.2	51.3	91.7	91.7
2022-10-13	3.5	19.6	95.8	95.8
2022-10-14	2.9	18.9	95.8	95.8
2022-10-15	5.1	37.5	100.0	100.0

(continued)

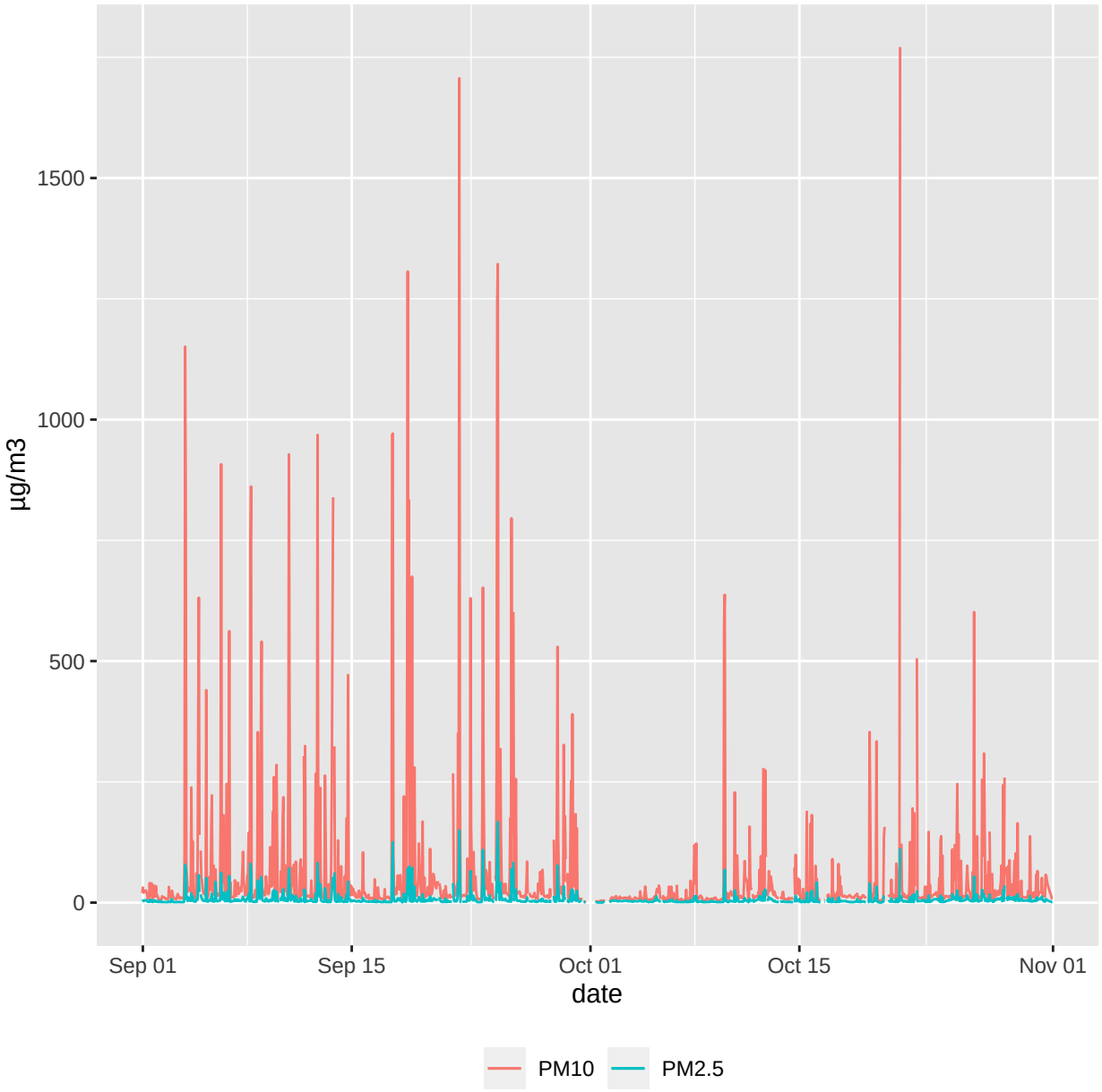
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-10-16	5.2	18.4	79.2	79.2
2022-10-17	3.0	21.0	100.0	100.0
2022-10-18	2.0	12.9	100.0	100.0
2022-10-19	4.6	34.4	91.7	91.7
2022-10-20	6.1	52.2	83.3	83.3
2022-10-21	8.4	102.5	95.8	95.8
2022-10-22	5.1	57.1	91.7	91.7
2022-10-23	3.8	19.3	100.0	100.0
2022-10-24	5.4	28.3	100.0	100.0
2022-10-25	8.3	54.1	95.8	95.8
2022-10-26	8.5	56.4	100.0	100.0
2022-10-27	7.8	69.1	91.7	91.7
2022-10-28	8.7	46.6	95.8	95.8
2022-10-29	7.9	39.2	100.0	100.0
2022-10-30	4.7	23.2	100.0	100.0
2022-10-31	5.1	24.6	91.7	91.7

Monthly Average

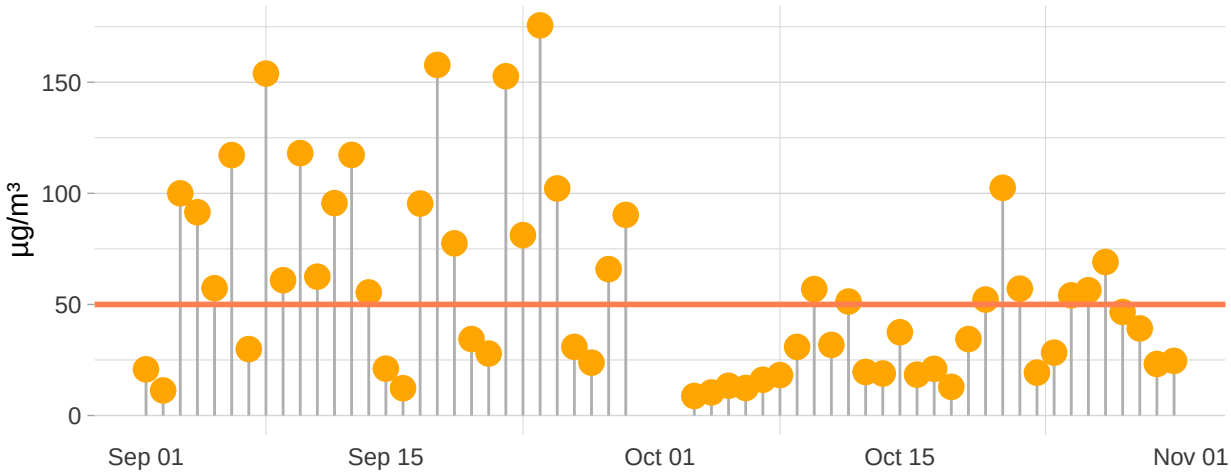
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
September 2022	9.206897	77.26552	97.83448	97.83448
October 2022	4.982759	33.98276	96.12069	96.12069

NA - Not enough data to calculate averages

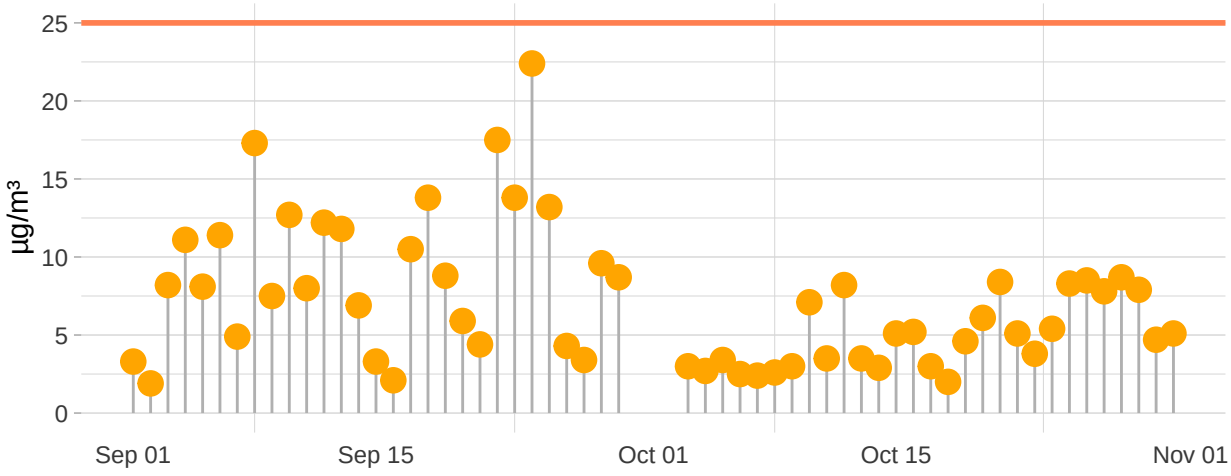
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

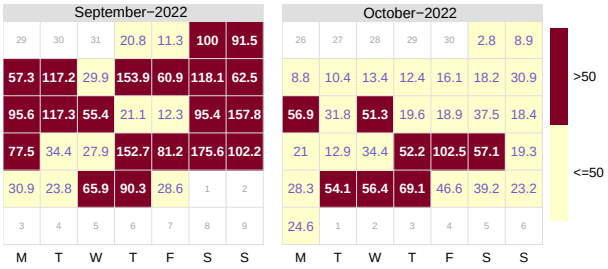


BENNETT RESOURCES

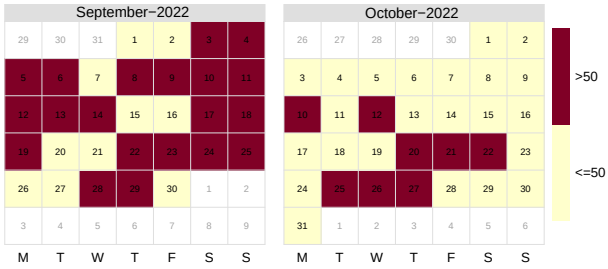
SITE: Ben397
Bi-Monthly Report
September 2022 - October 2022

Daily Exceedances

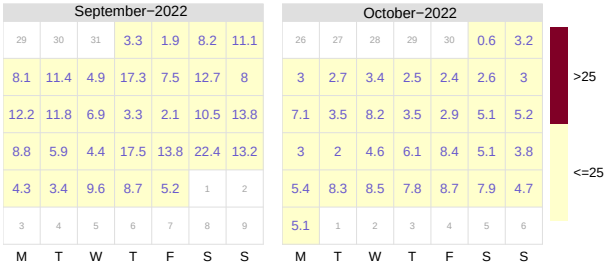
PM$_{10}$. Daily Exceedances at Ben397



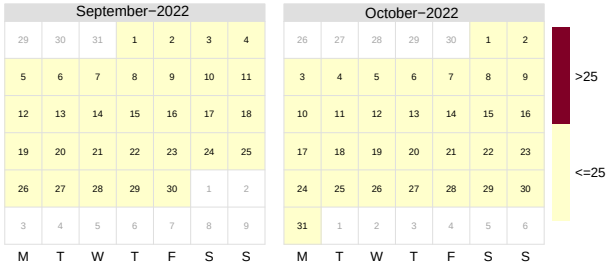
PM$_{10}$. Days with Exceedances at Ben397



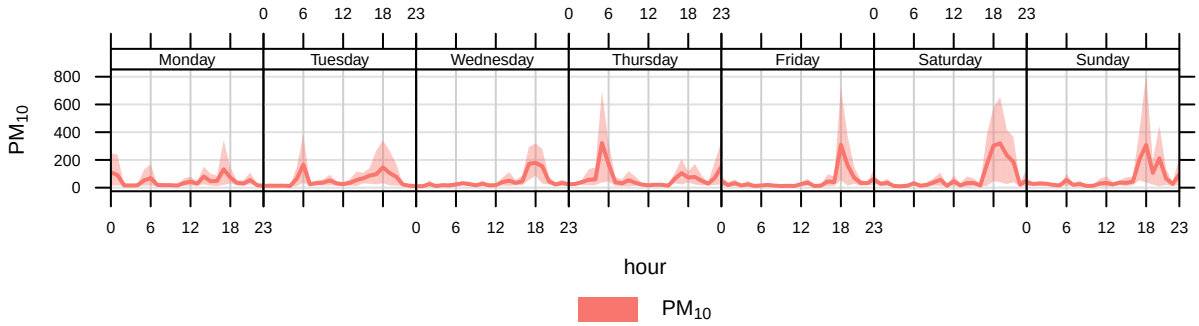
PM$_{2.5}$. Daily Exceedances at Ben397

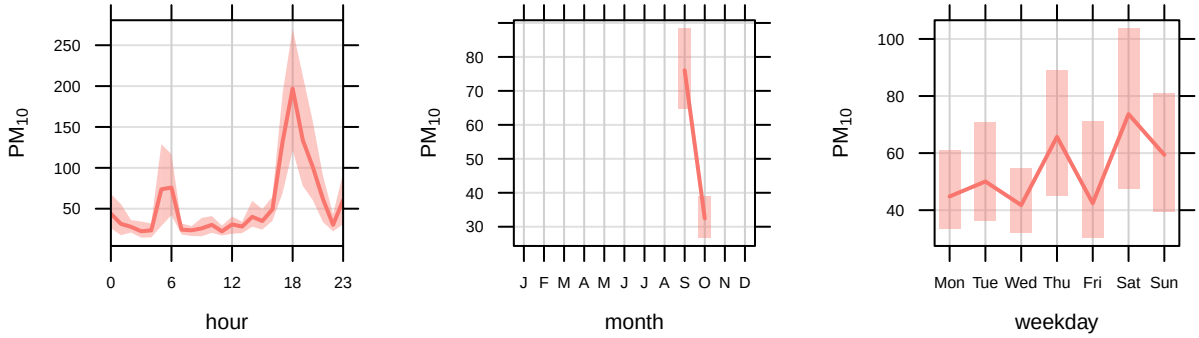


PM$_{2.5}$. Days with Exceedances at Ben397



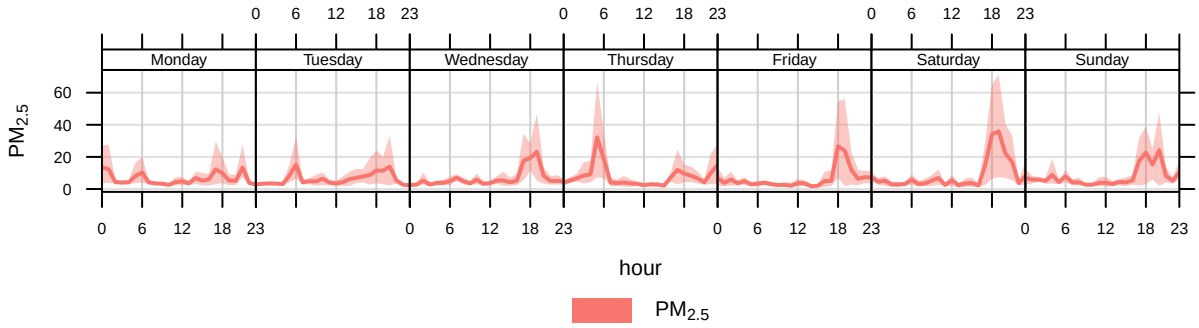
PM_{10} Time variation at Ben397

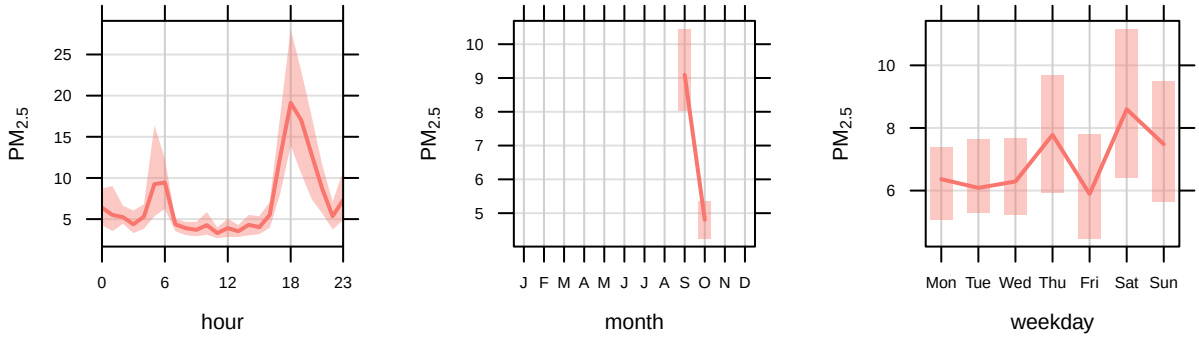




mean and 95% confidence interval in mean

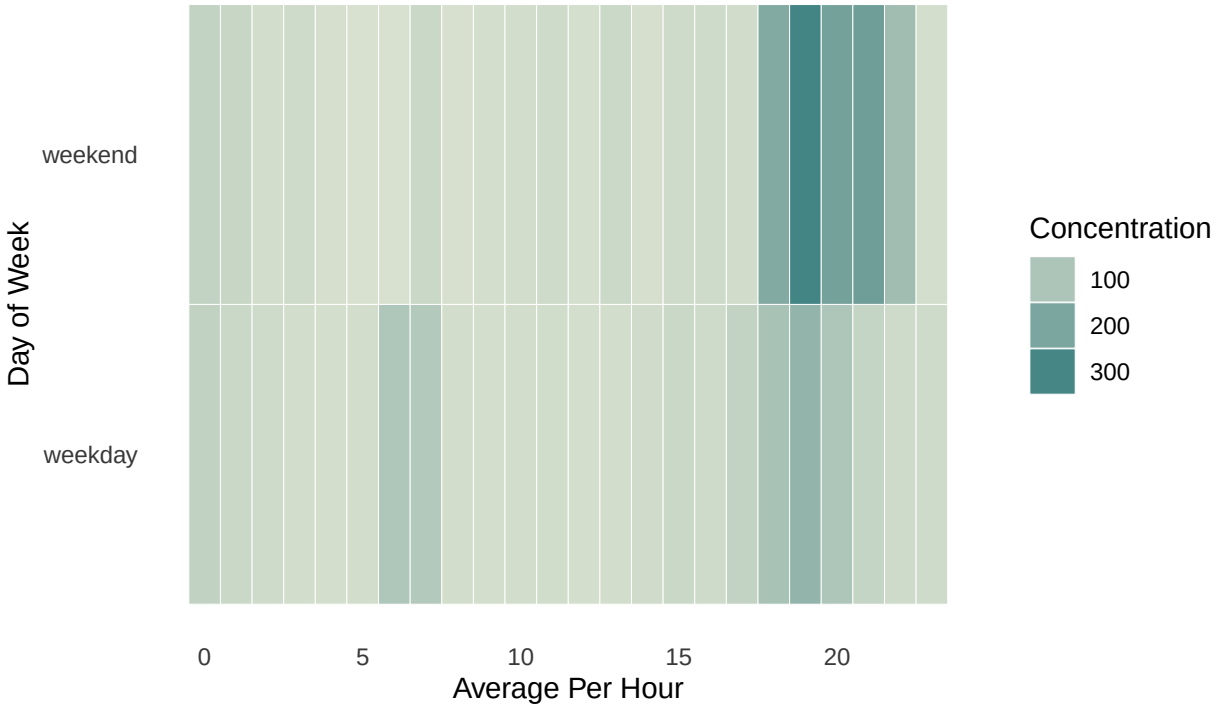
$PM_{2.5}$ Time variation at Ben397



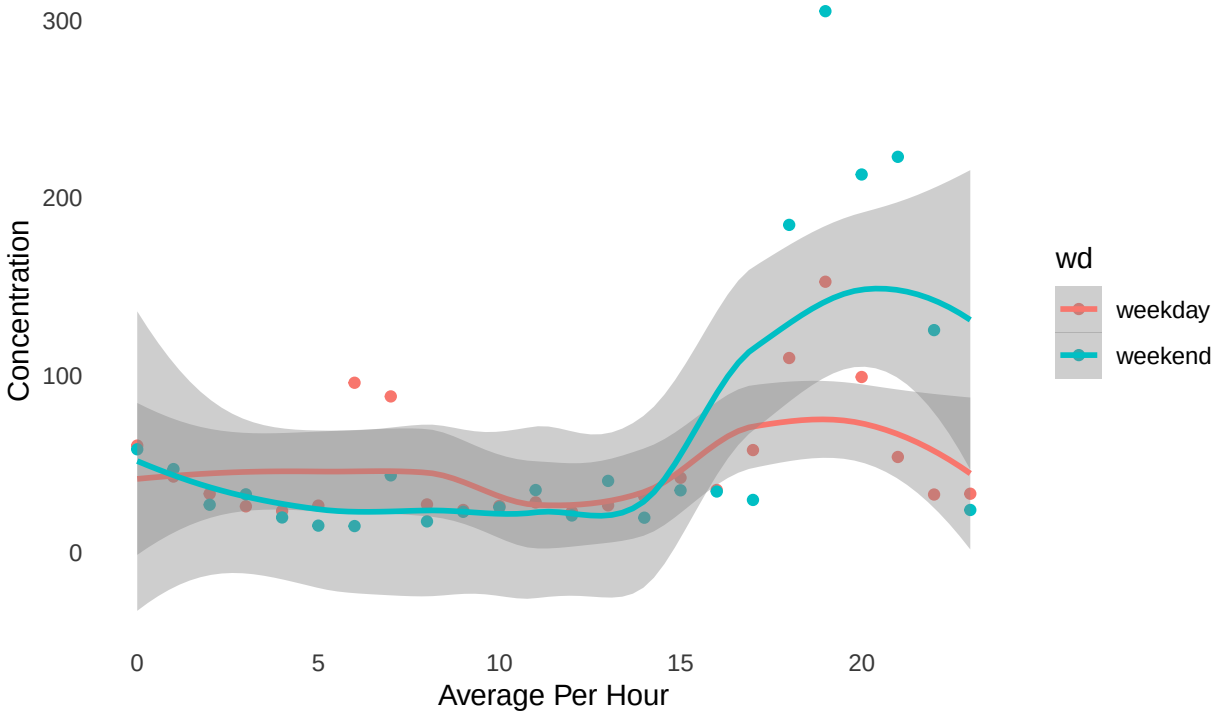


mean and 95% confidence interval in mean

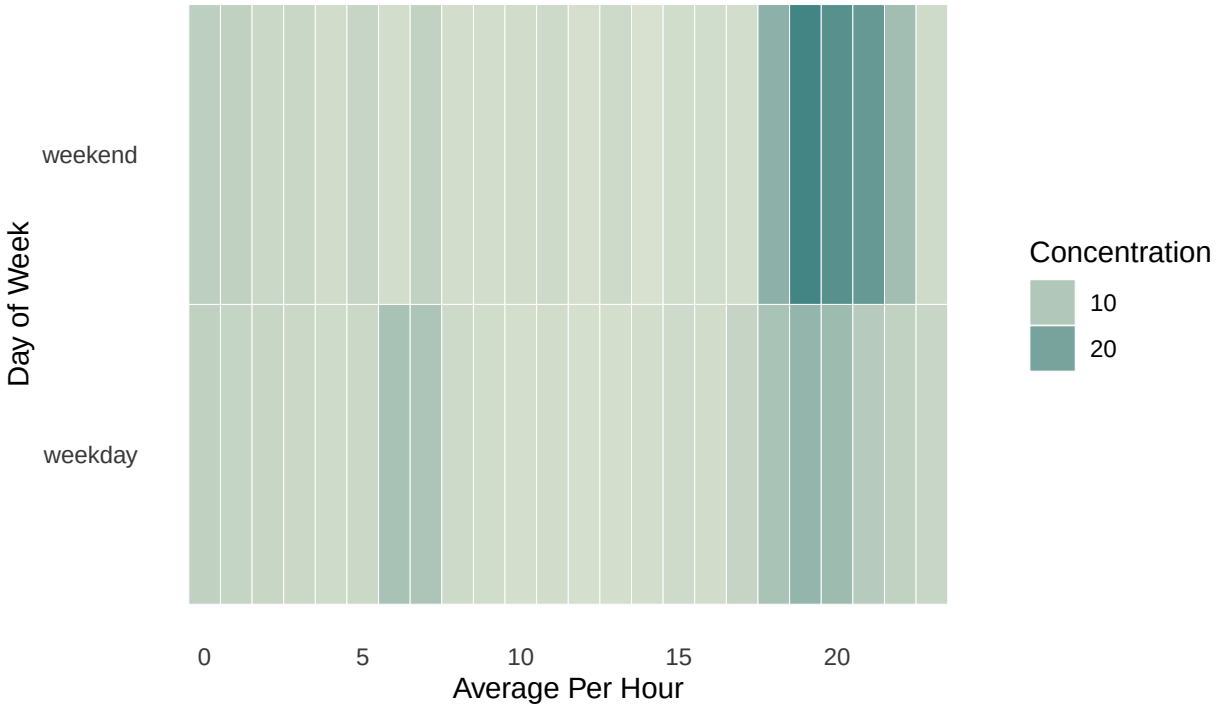
PM10 concentration by Weekday/weekend and Hour



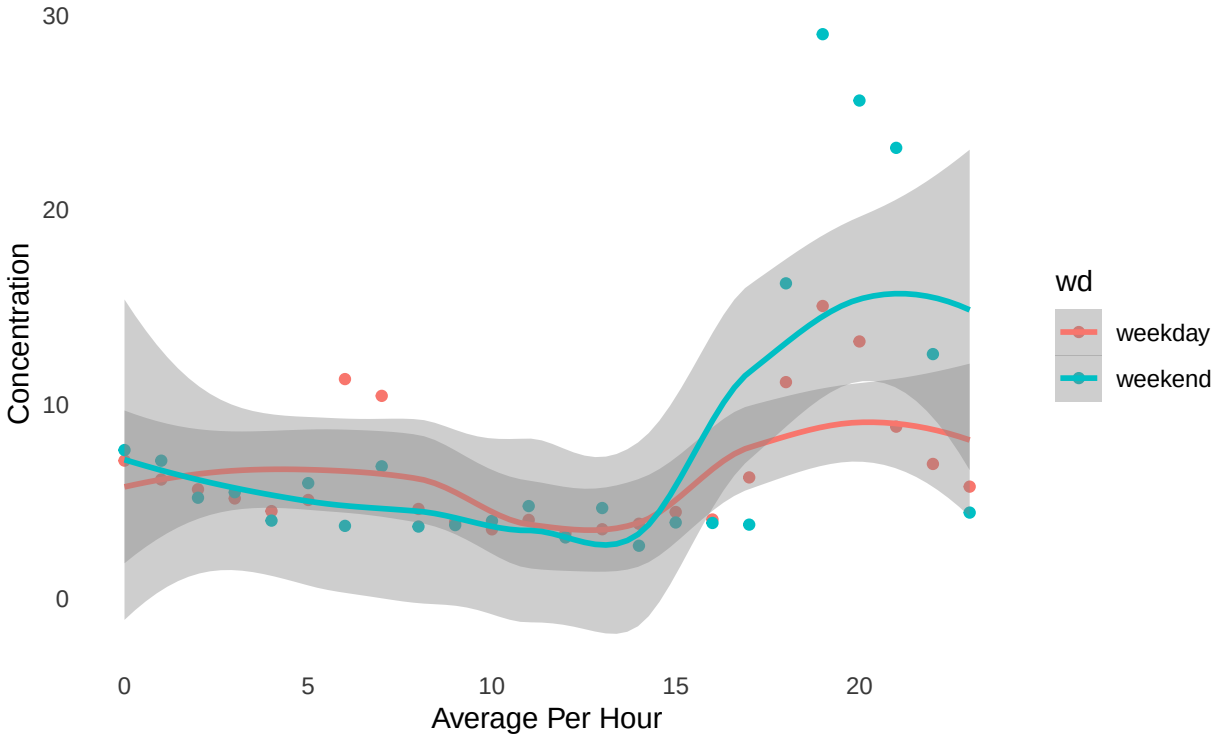
PM10 concentration by weekday and weekend with trend



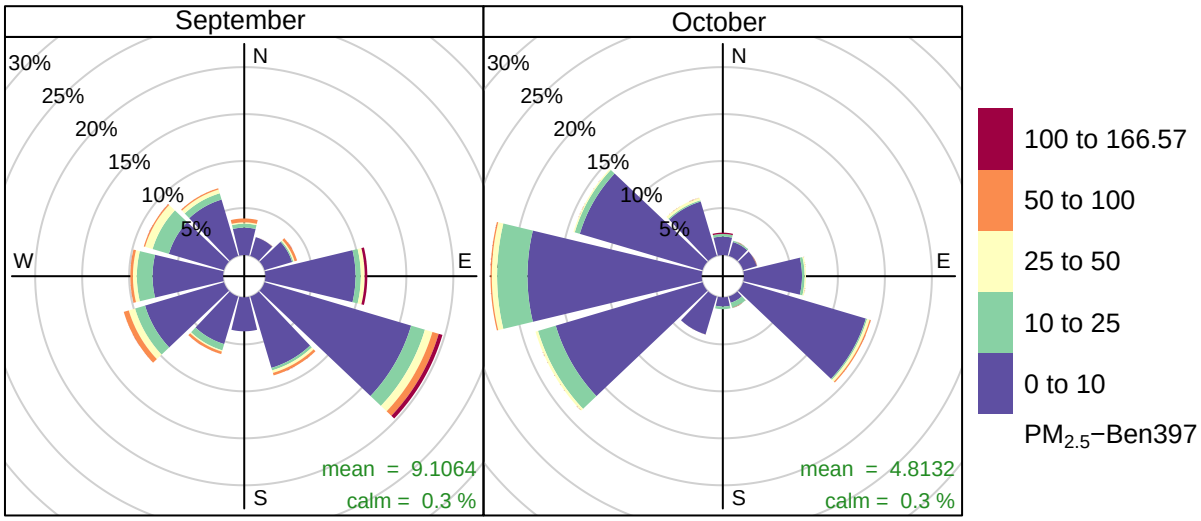
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

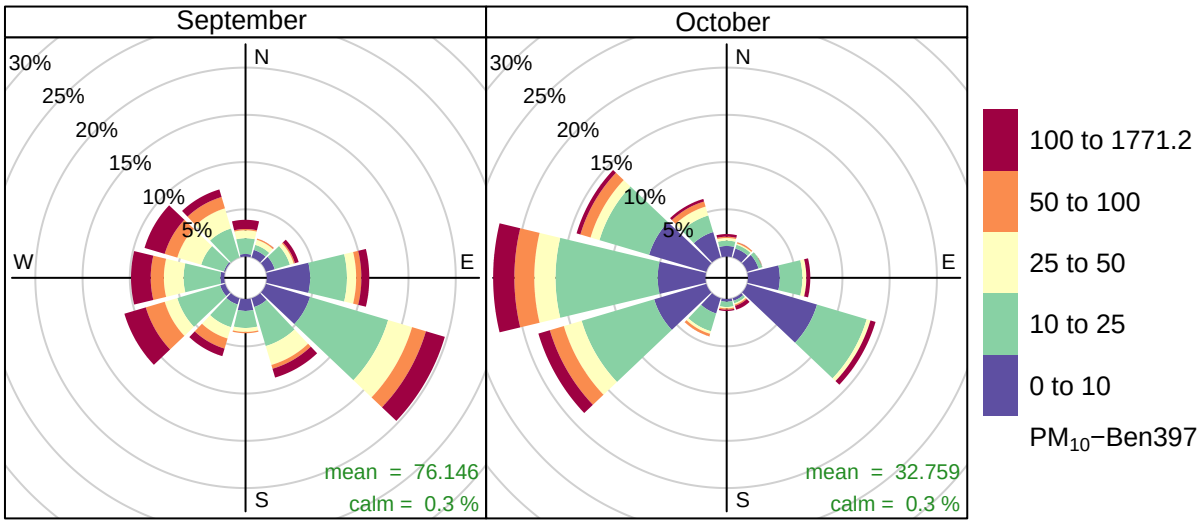


$PM_{2.5}$ pollution rose at Ben397



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben397



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN397]

November 2022

SITE: Ben397
Bi-Monthly Report
November 2022 - November 2022

Daily Averages

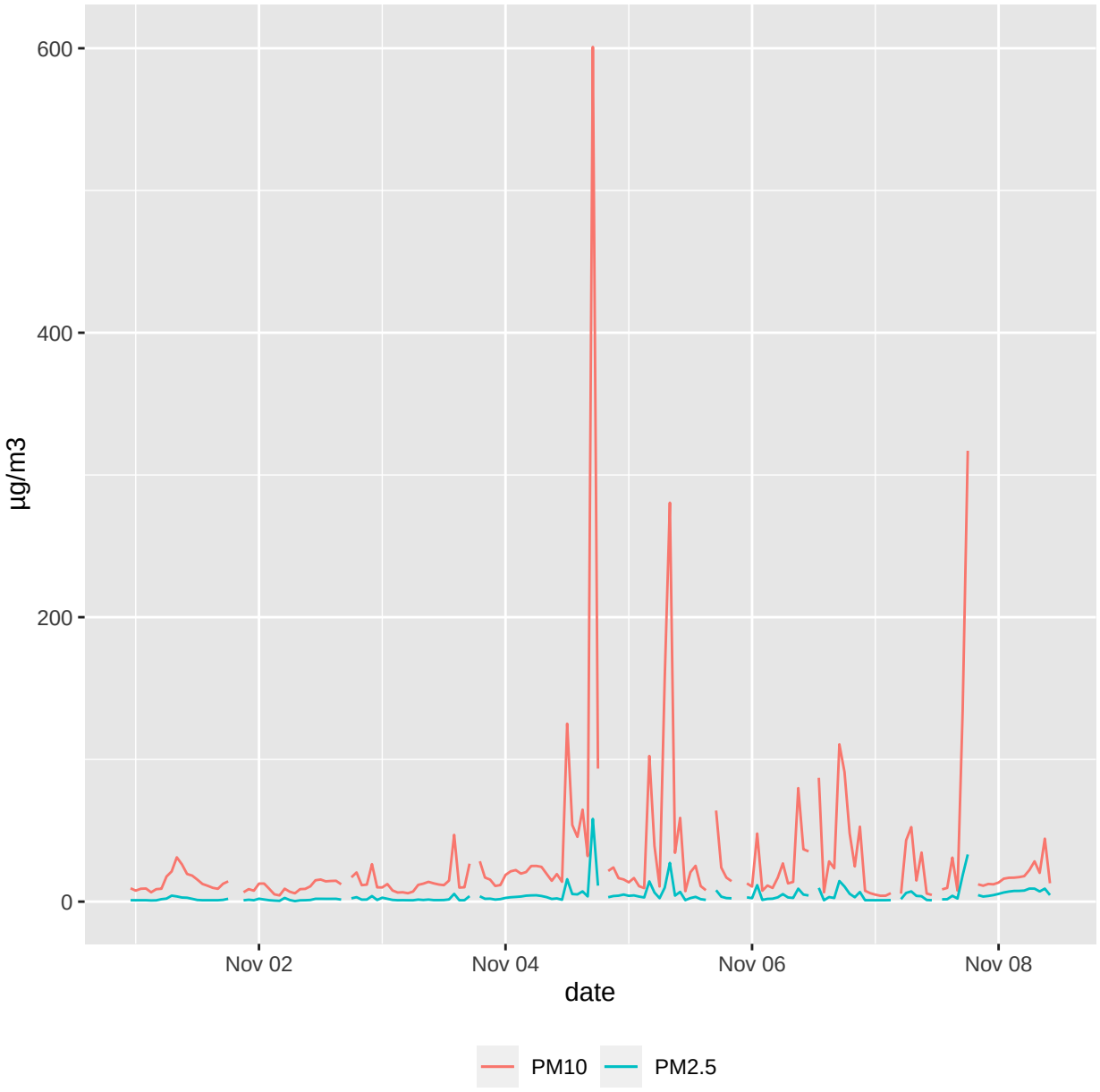
	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-11-01	1.6	13.3	91.7	91.7
2022-11-02	1.6	12.1	95.8	95.8
2022-11-03	1.8	14.0	95.8	95.8
2022-11-04	7.0	58.2	95.8	95.8
2022-11-05	5.5	44.7	87.5	87.5
2022-11-06	4.8	34.6	95.8	95.8
2022-11-07	5.1	35.1	87.5	87.5
2022-11-08	NA	NA	45.8	45.8

Monthly Average

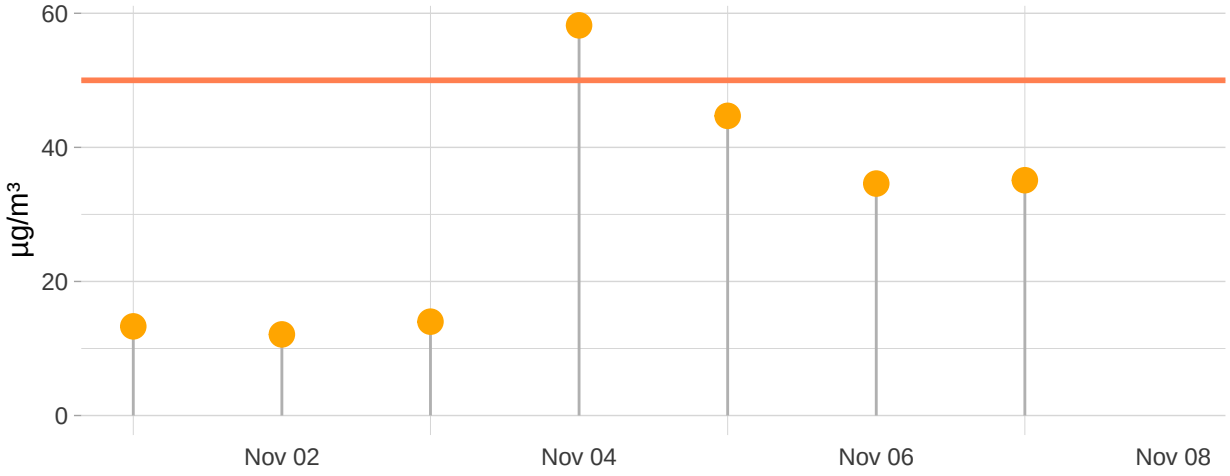
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
November 2022	NA	NA	NA	NA

NA - Not enough data to calculate averages

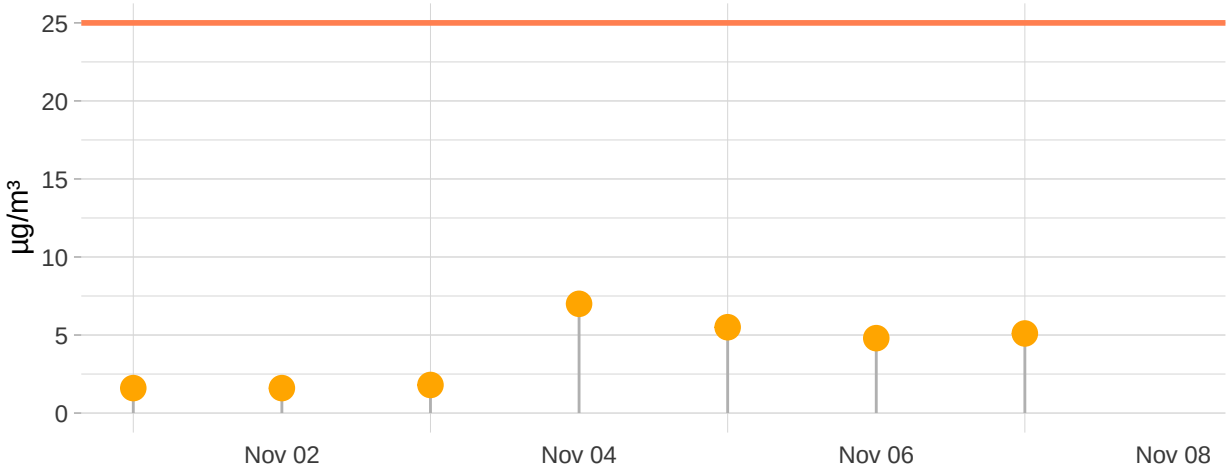
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

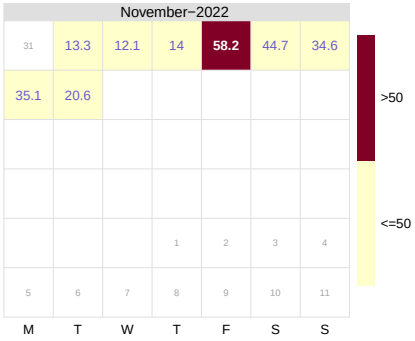


BENNETT RESOURCES

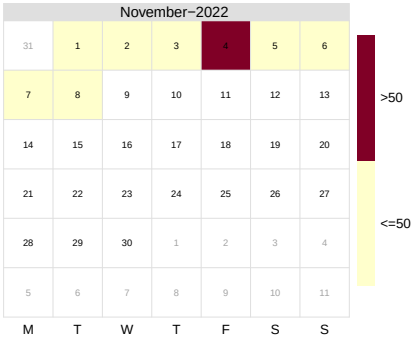
SITE: Ben397
Bi-Monthly Report
November 2022 - November 2022

Daily Exceedances

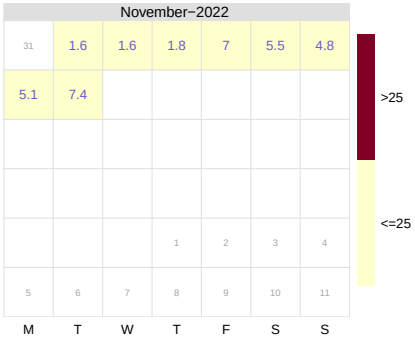
PM_{10}. Daily Exceedances at Ben397



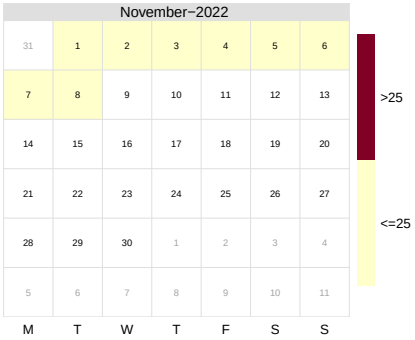
PM_{10}. Days with Exceedances at Ben397



$PM_{2.5}$. Daily Exceedances at Ben397



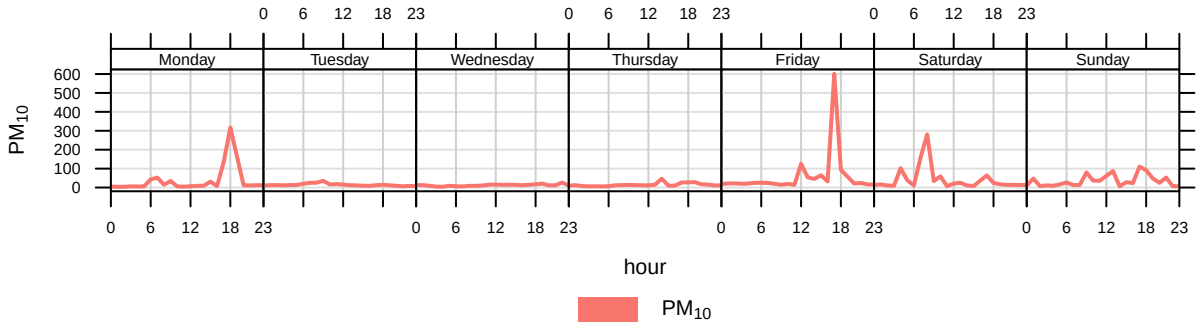
$PM_{2.5}$. Days with Exceedances at Ben397

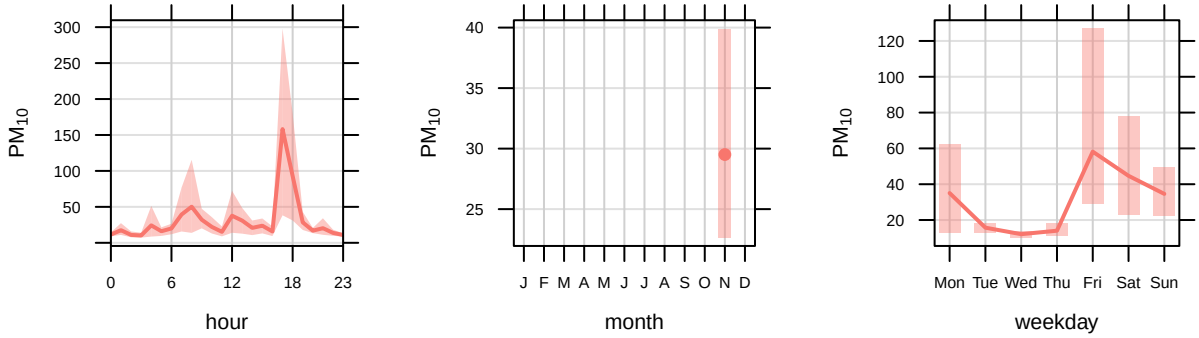


BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
November 2022 - November 2022

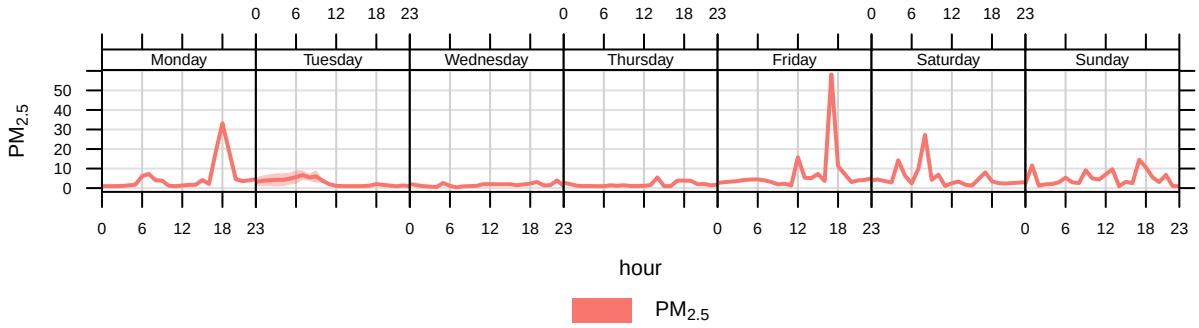
PM_{10} Time variation at Ben397

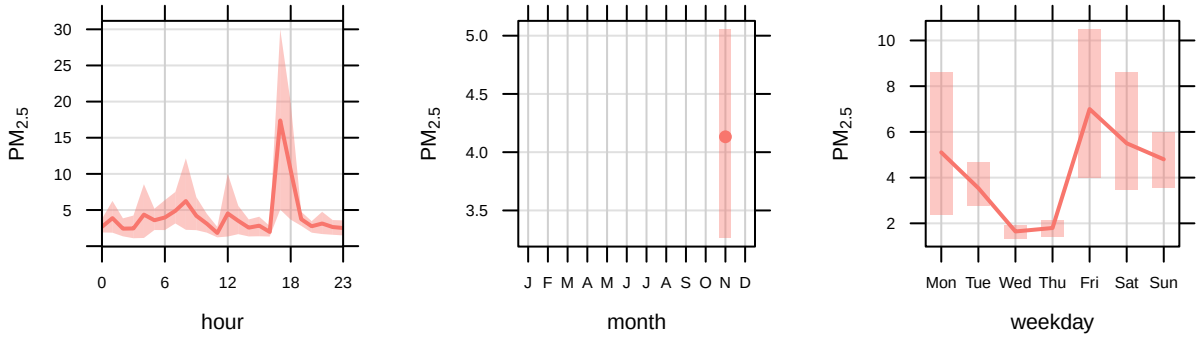




mean and 95% confidence interval in mean

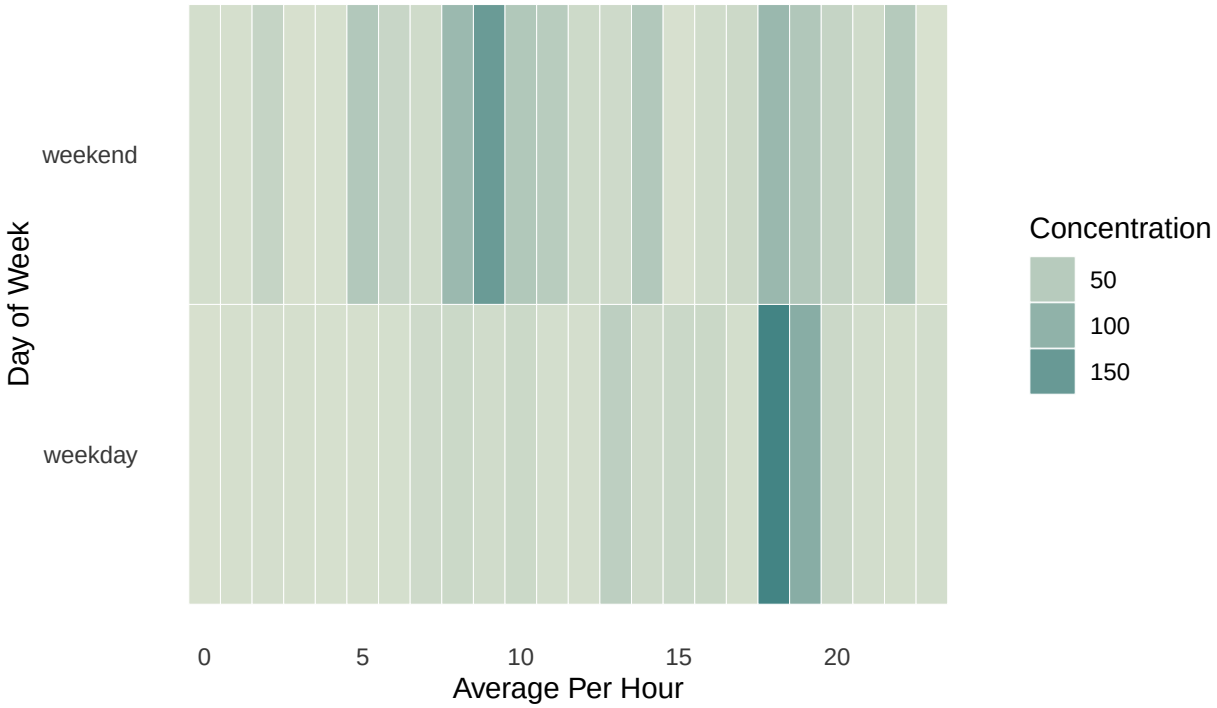
$PM_{2.5}$ Time variation at Ben397



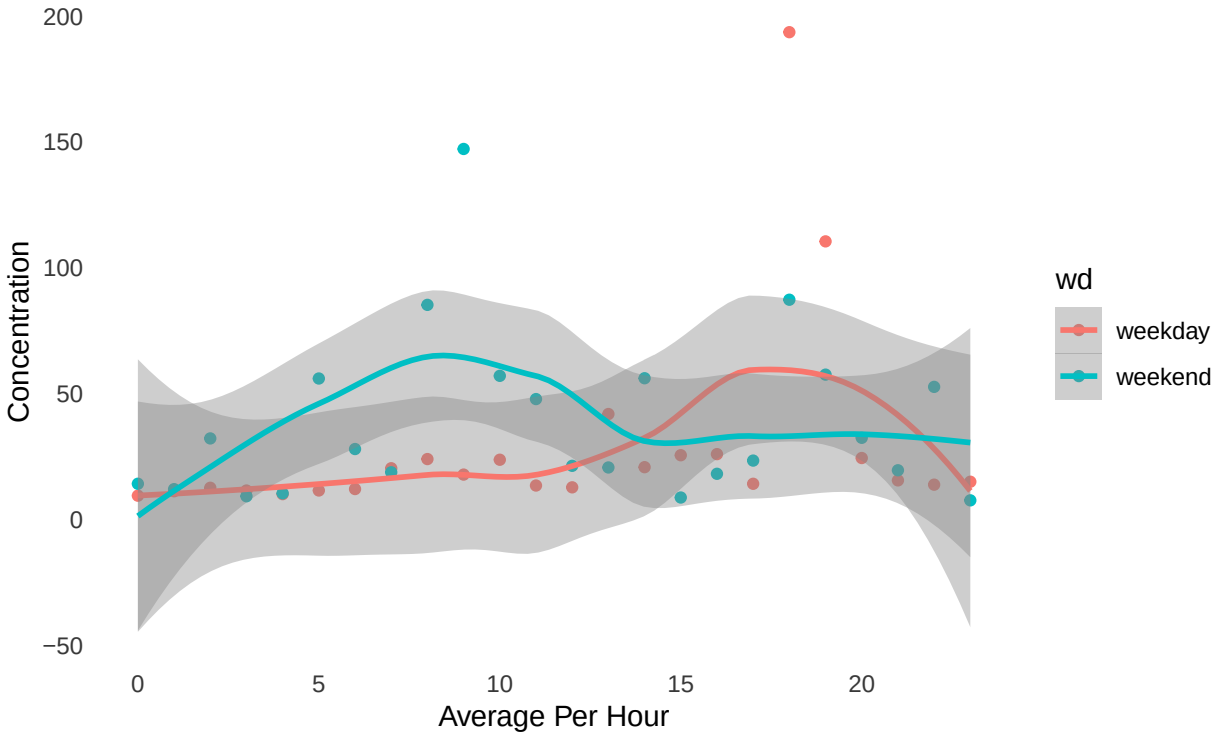


mean and 95% confidence interval in mean

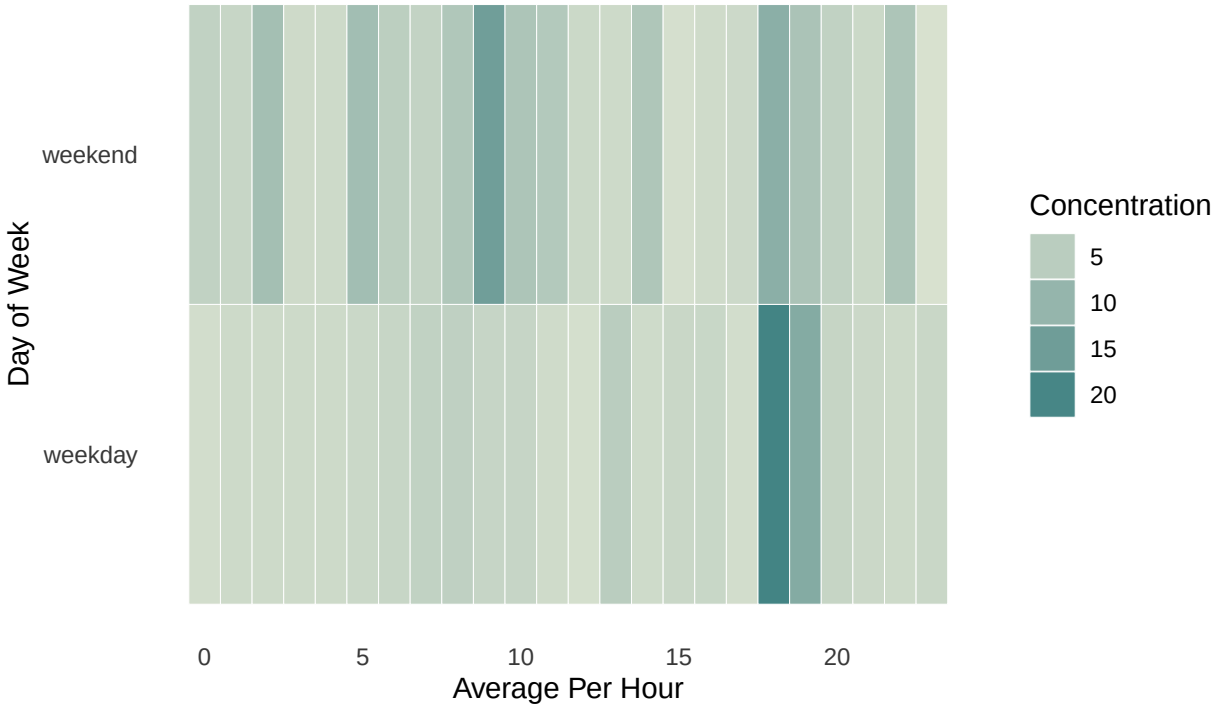
PM10 concentration by Weekday/weekend and Hour



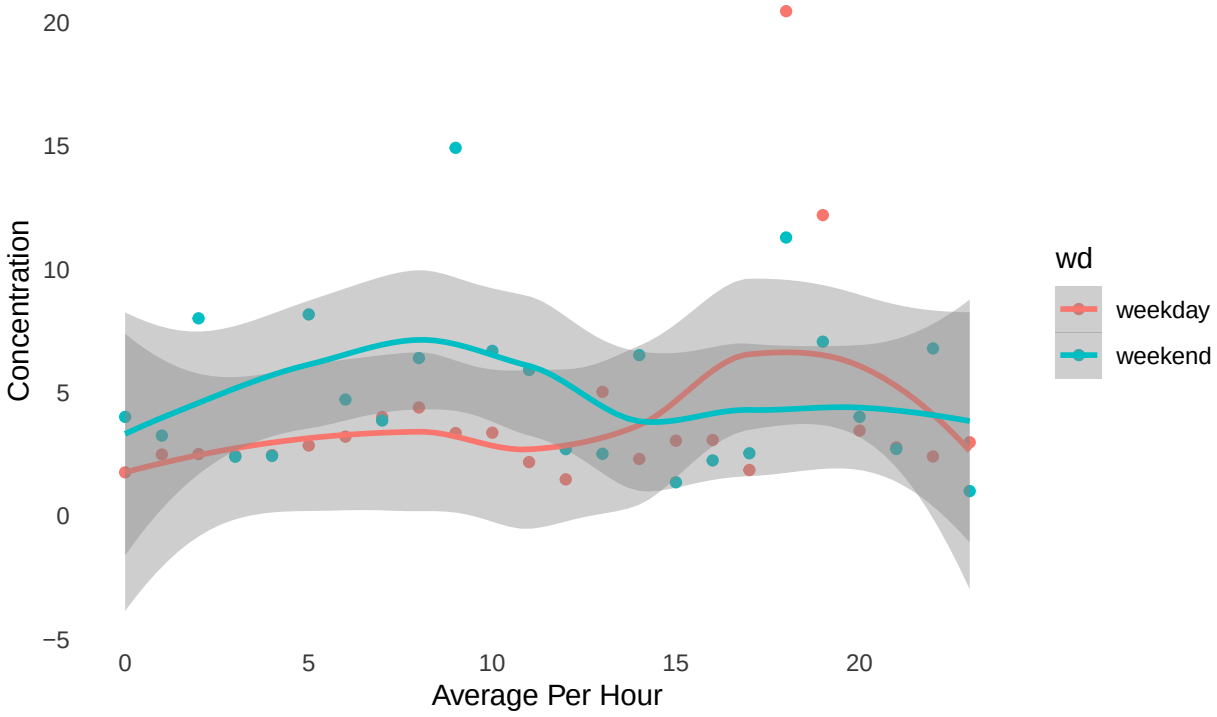
PM10 concentration by weekday and weekend with trend



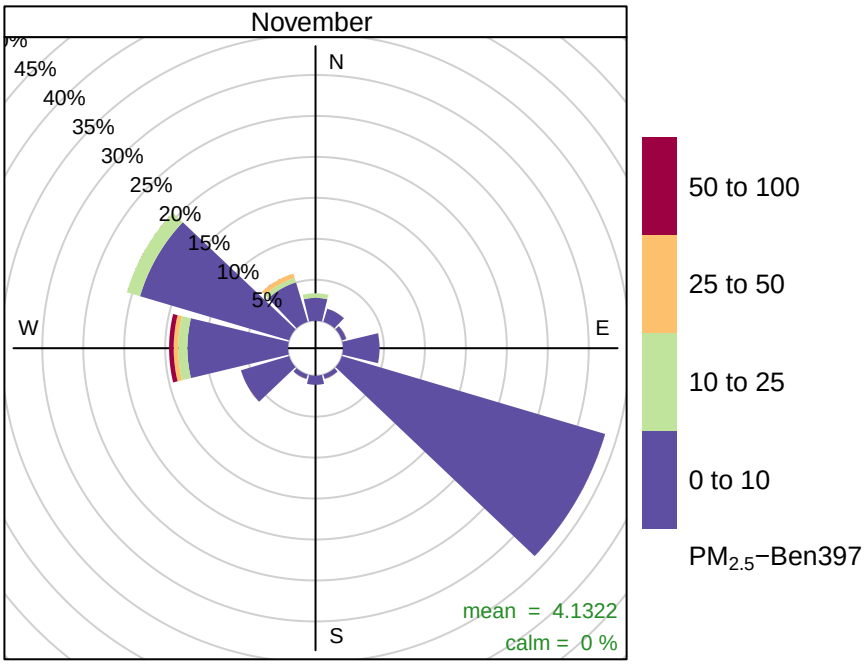
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

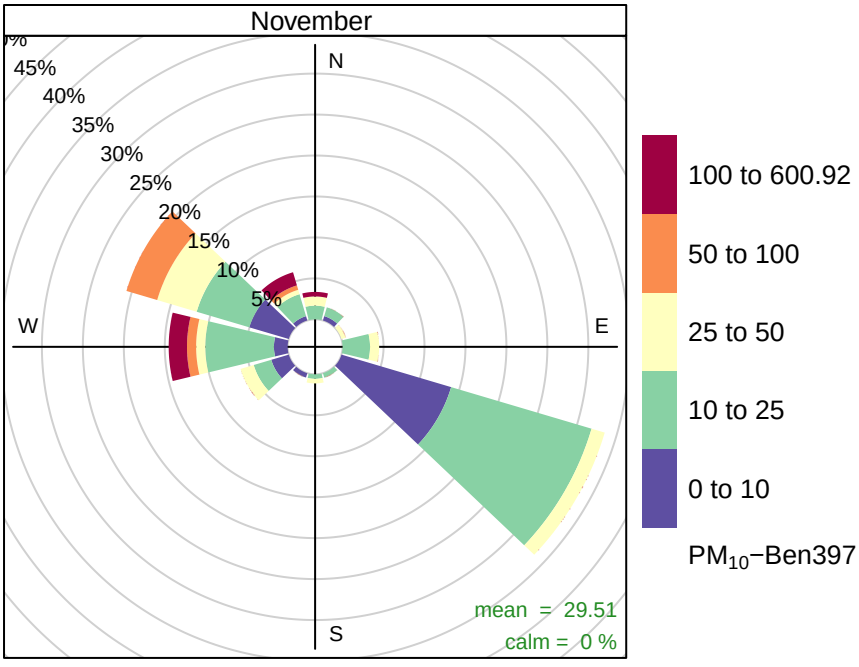


$PM_{2.5}$ pollution rose at Ben397



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben397



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN398]

May-June 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
May 2022 - June 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-05-02	NA	NA	41.7	41.7
2022-05-03	2.6	8.4	100.0	100.0
2022-05-04	2.3	12.7	95.8	95.8
2022-05-05	2.2	12.6	100.0	100.0
2022-05-06	5.1	24.7	100.0	100.0
2022-05-07	4.4	9.7	100.0	100.0
2022-05-08	3.0	7.8	100.0	100.0
2022-05-09	3.9	9.1	100.0	100.0
2022-05-10	8.9	15.1	100.0	100.0
2022-05-11	6.9	11.2	100.0	100.0
2022-05-12	9.1	15.3	100.0	100.0
2022-05-13	4.0	8.3	100.0	100.0
2022-05-14	4.1	8.9	100.0	100.0
2022-05-15	4.3	9.9	100.0	100.0
2022-05-16	3.5	9.2	100.0	100.0
2022-05-17	3.6	15.6	100.0	100.0
2022-05-18	2.8	11.3	100.0	100.0
2022-05-19	4.5	16.7	100.0	100.0
2022-05-20	3.1	13.2	100.0	100.0
2022-05-21	2.2	6.6	100.0	100.0
2022-05-22	3.2	8.8	91.7	91.7
2022-05-23	4.7	12.9	100.0	100.0
2022-05-24	7.5	13.0	100.0	100.0
2022-05-25	5.0	11.8	100.0	100.0
2022-05-26	3.8	10.8	100.0	100.0
2022-05-27	6.3	12.3	100.0	100.0
2022-05-28	6.8	13.3	100.0	100.0
2022-05-29	6.2	13.7	95.8	95.8
2022-05-30	6.0	12.8	100.0	100.0
2022-05-31	10.0	18.1	100.0	100.0
2022-06-01	2.4	4.3	100.0	100.0
2022-06-02	2.1	4.1	100.0	100.0
2022-06-03	4.1	5.6	100.0	100.0
2022-06-04	4.2	5.9	100.0	100.0
2022-06-05	2.6	5.1	100.0	100.0
2022-06-06	3.4	6.3	100.0	100.0
2022-06-07	4.1	6.7	100.0	100.0
2022-06-08	5.9	11.6	100.0	100.0
2022-06-09	5.4	11.5	100.0	100.0
2022-06-10	5.0	9.4	100.0	100.0
2022-06-11	8.8	13.3	100.0	100.0
2022-06-12	11.5	15.7	100.0	100.0
2022-06-13	13.0	18.9	100.0	100.0
2022-06-14	10.7	15.5	100.0	100.0
2022-06-15	10.4	14.3	100.0	100.0

(continued)

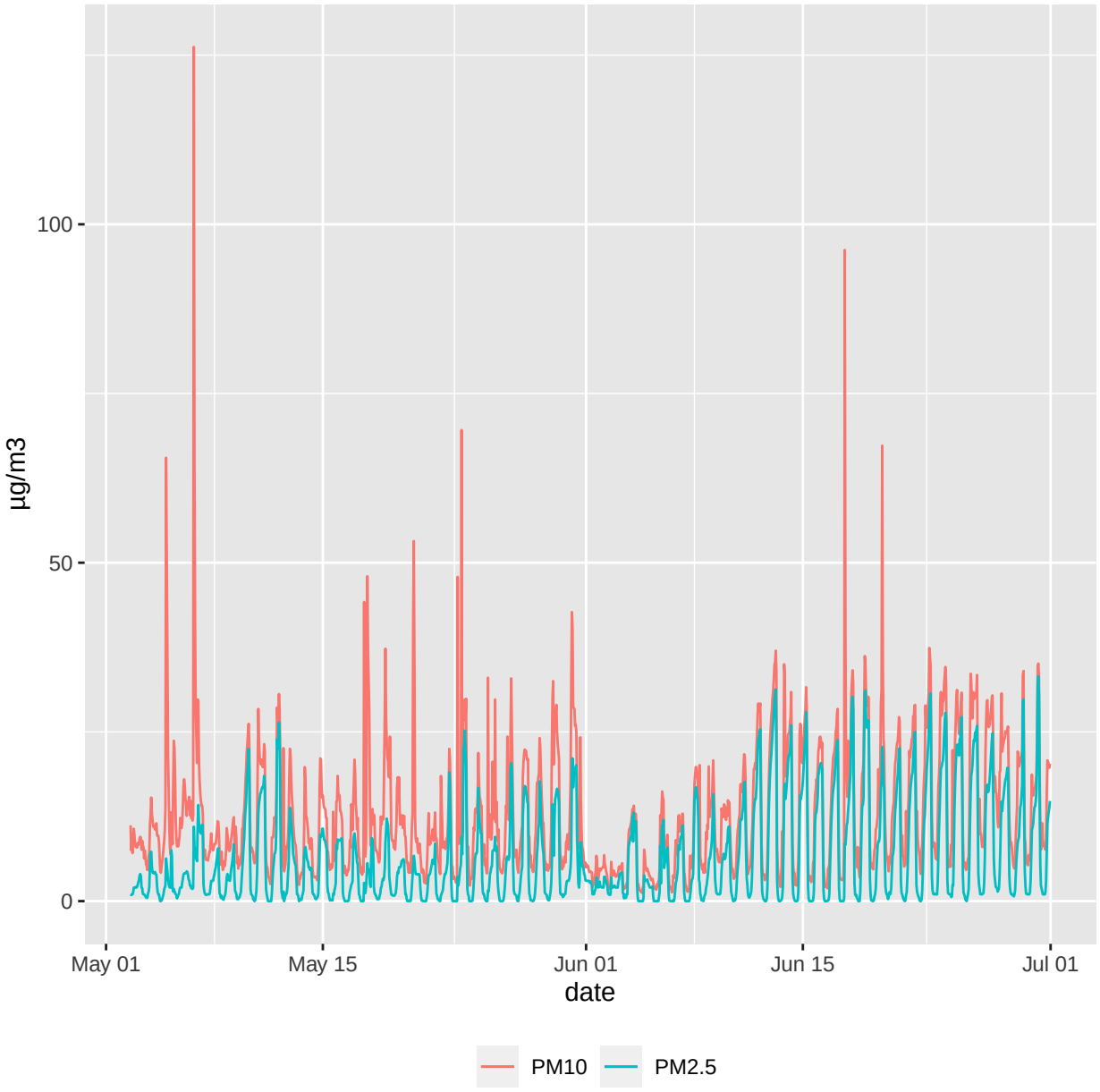
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-06-16	9.1	12.8	100.0	100.0
2022-06-17	9.9	19.1	100.0	100.0
2022-06-18	11.3	16.0	100.0	100.0
2022-06-19	10.8	16.1	95.8	95.8
2022-06-20	8.1	16.7	100.0	100.0
2022-06-21	9.1	15.5	100.0	100.0
2022-06-22	9.9	16.8	100.0	100.0
2022-06-23	12.3	19.8	100.0	100.0
2022-06-24	12.6	19.6	100.0	100.0
2022-06-25	11.9	18.0	100.0	100.0
2022-06-26	12.0	20.4	100.0	100.0
2022-06-27	11.0	21.6	100.0	100.0
2022-06-28	8.3	15.3	100.0	100.0
2022-06-29	9.5	14.8	100.0	100.0
2022-06-30	11.2	17.0	100.0	100.0

Monthly Average

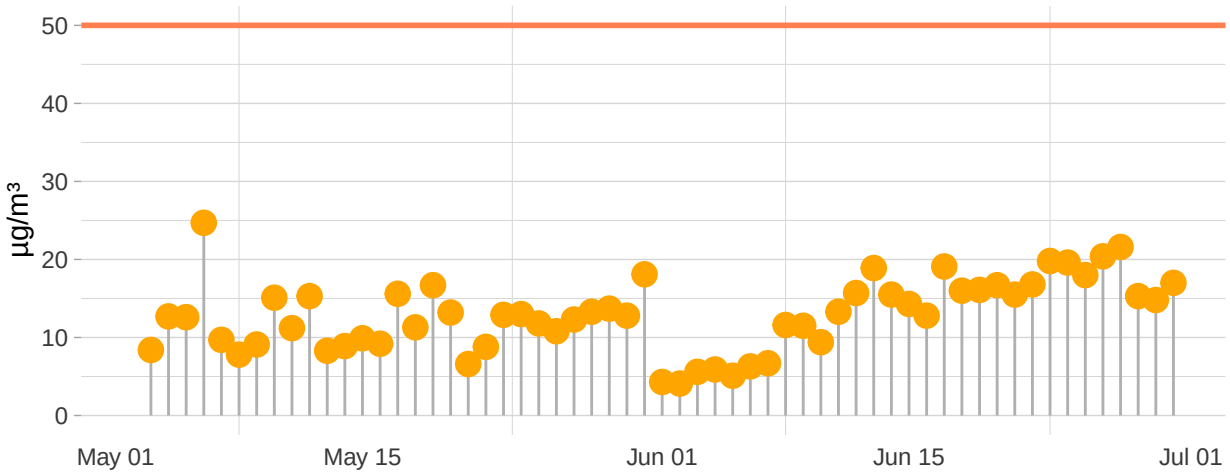
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
May 2022	4.827586	12.20	97.50	97.50
June 2022	8.353333	13.59	99.86	99.86

NA - Not enough data to calculate averages

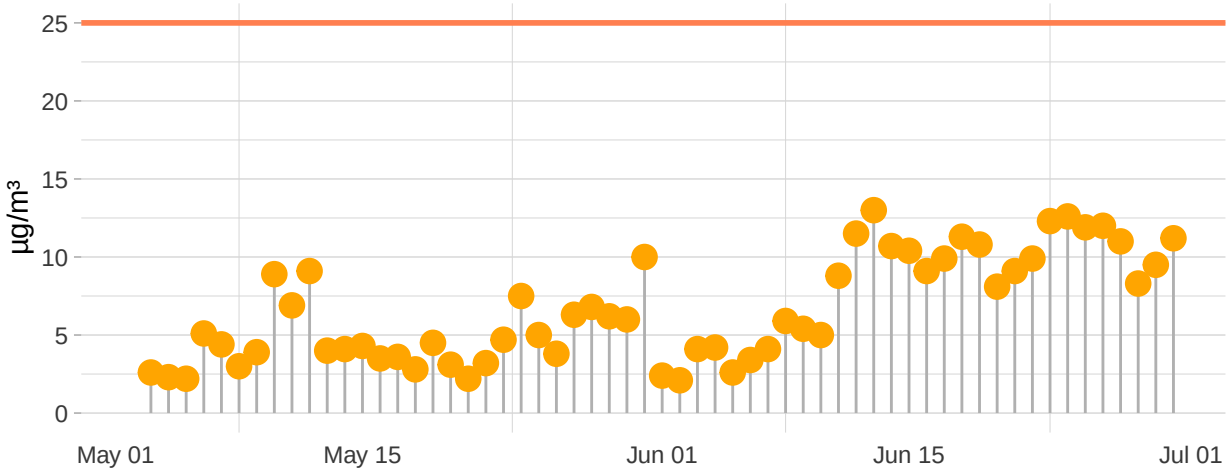
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages



BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
May 2022 - June 2022

Daily Exceedances

PM_{10}. Daily Exceedances at Ben398

May−2022						
25	26	27	28	29	30	
8.9	8.4	12.7	12.6	24.7	9.7	7.8
9.1	15.1	11.2	15.3	8.3	8.9	9.9
9.2	15.6	11.3	16.7	13.2	6.6	8.8
12.9	13	11.8	10.8	12.3	13.3	13.7
12.8	18.1	1	2	3	4	5
M	T	W	T	F	S	S

June−2022						
30	31	4.3	4	5.6	5.9	5.1
6.3	6.7	11.6	11.5	9.4	13.3	15.7
18.9	15.5	14.3	12.8	19.1	16	16.1
16.7	15.5	16.8	19.8	19.6	18	20.4
21.6	15.3	14.8	17	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

>50
<=50

PM_{10}. Days with Exceedances at Ben398

May−2022						
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5
M	T	W	T	F	S	S

June−2022						
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

>50
<=50

$PM_{2.5}$. Daily Exceedances at Ben398

May−2022						
25	26	27	28	29	30	
1.5	2.6	2.3	2.2	5.1	4.4	3
3.9	8.9	6.9	9.1	4	4.1	4.3
3.5	3.6	2.8	4.5	3.1	2.2	3.2
4.7	7.5	5	3.8	6.3	6.8	6.2
6	10	1	2	3	4	5
M	T	W	T	F	S	S

June−2022						
30	31	2.4	2.1	4.1	4.2	2.6
3.4	4	5.9	5.4	5	8.8	11.5
13	10.7	10.4	9.1	9.9	11.3	10.8
8.1	9.1	9.9	12.3	12.6	11.9	11.9
11	8.3	9.5	11.2	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

>25
<=25

$PM_{2.5}$. Days with Exceedances at Ben398

May−2022						
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5
M	T	W	T	F	S	S

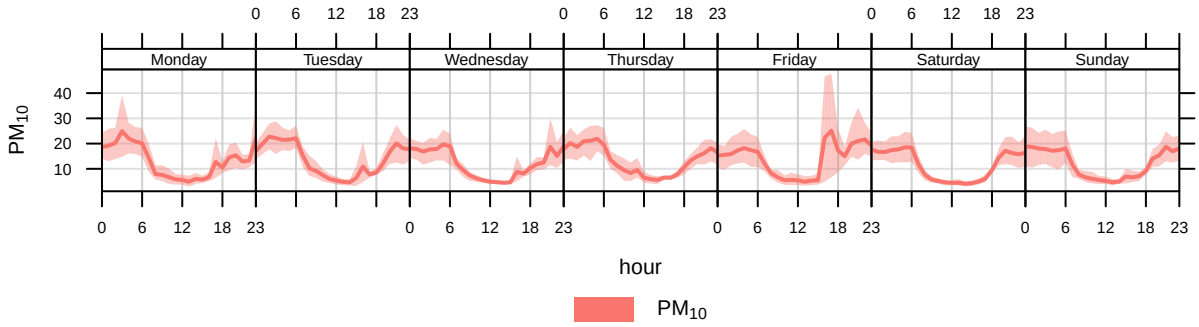
June−2022						
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

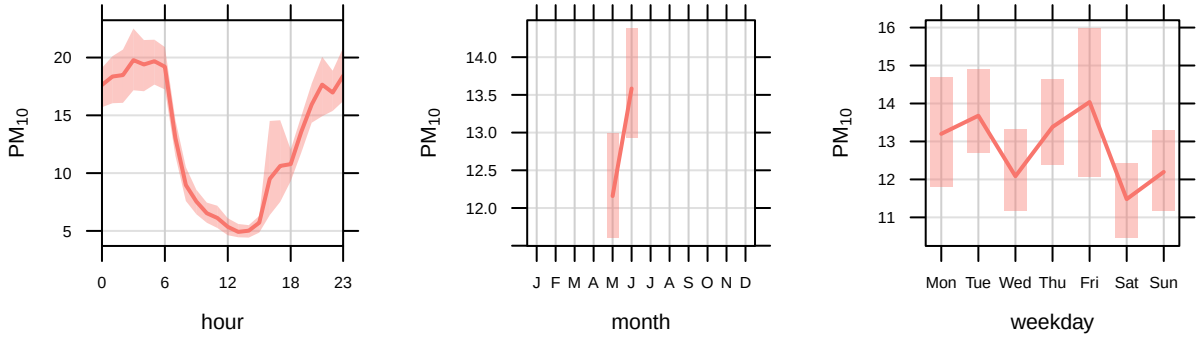
>25
<=25

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
May 2022 - June 2022

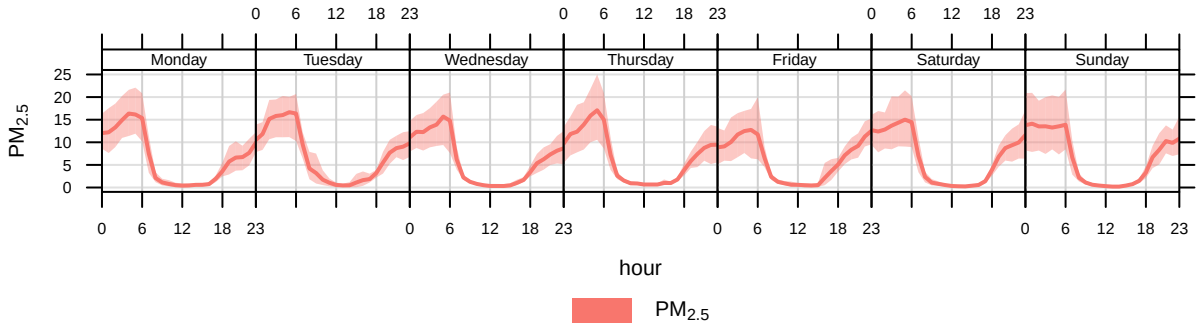
PM_{10} Time variation at Ben398

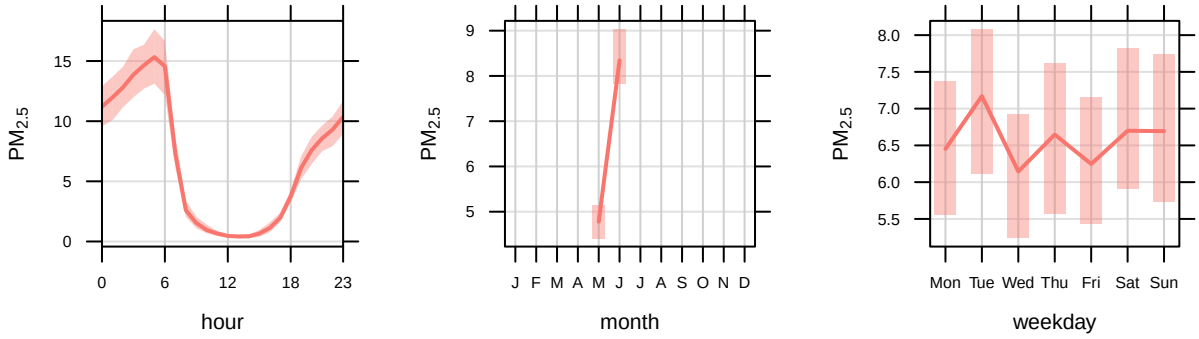




mean and 95% confidence interval in mean

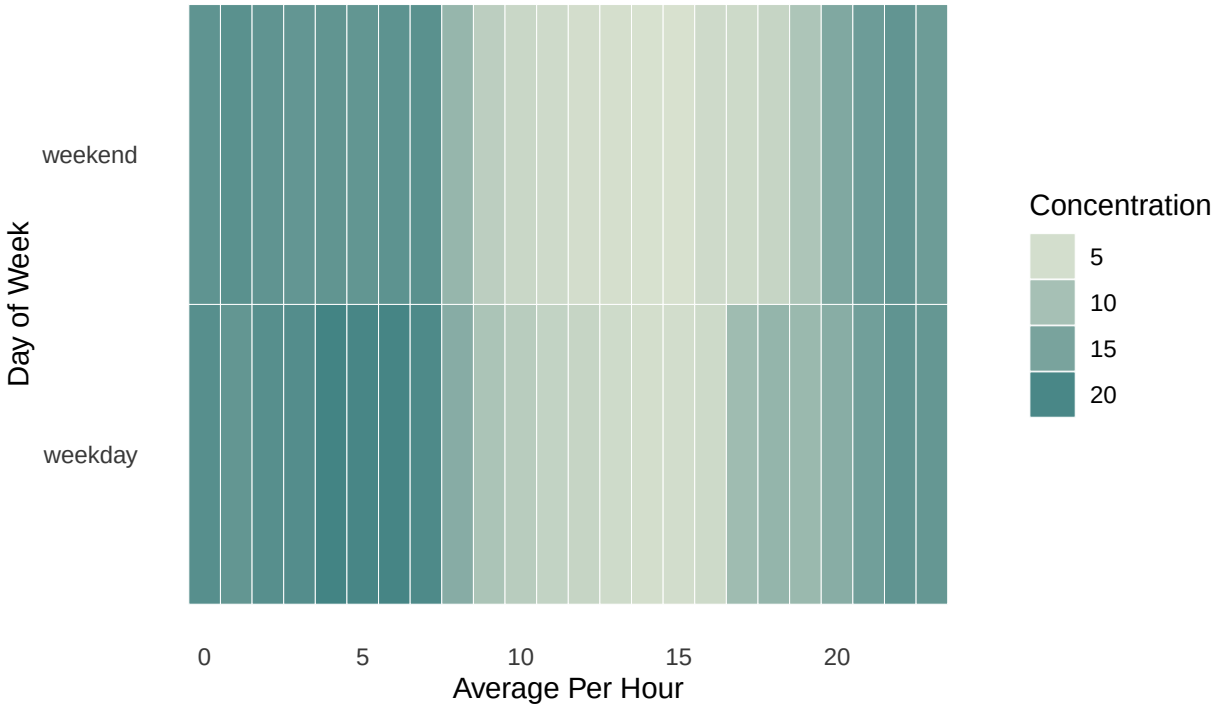
$PM_{2.5}$ Time variation at Ben398



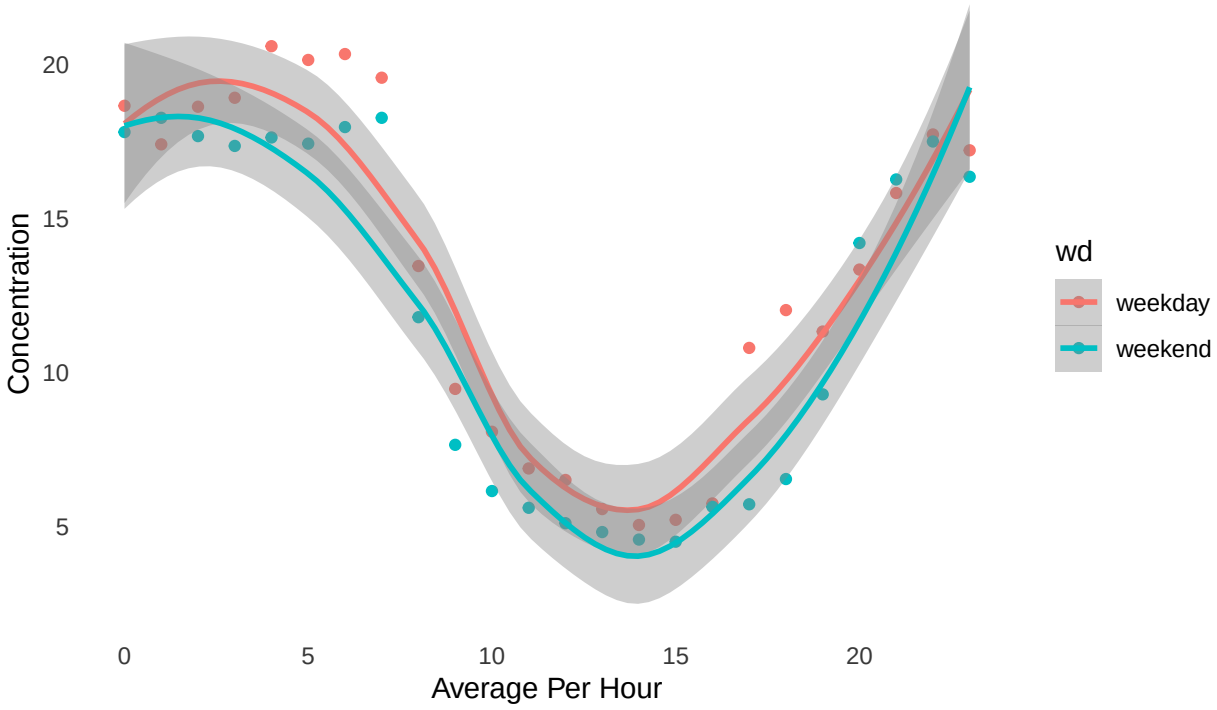


mean and 95% confidence interval in mean

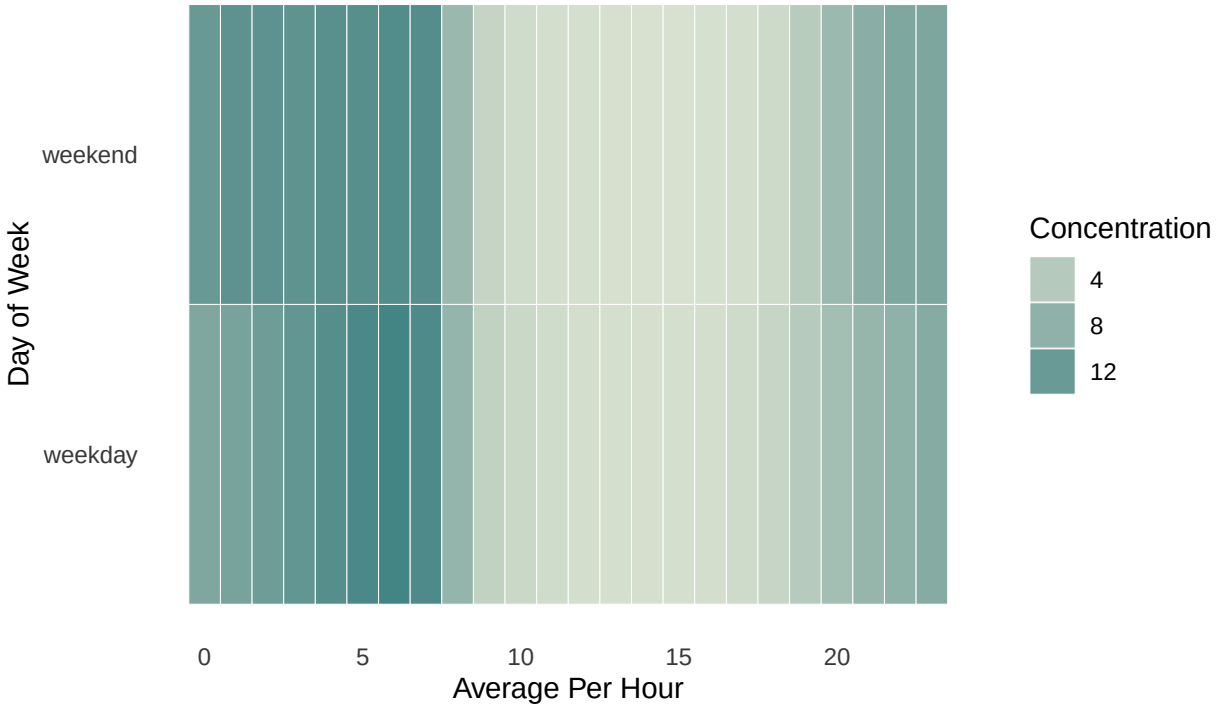
PM10 concentration by Weekday/weekend and Hour



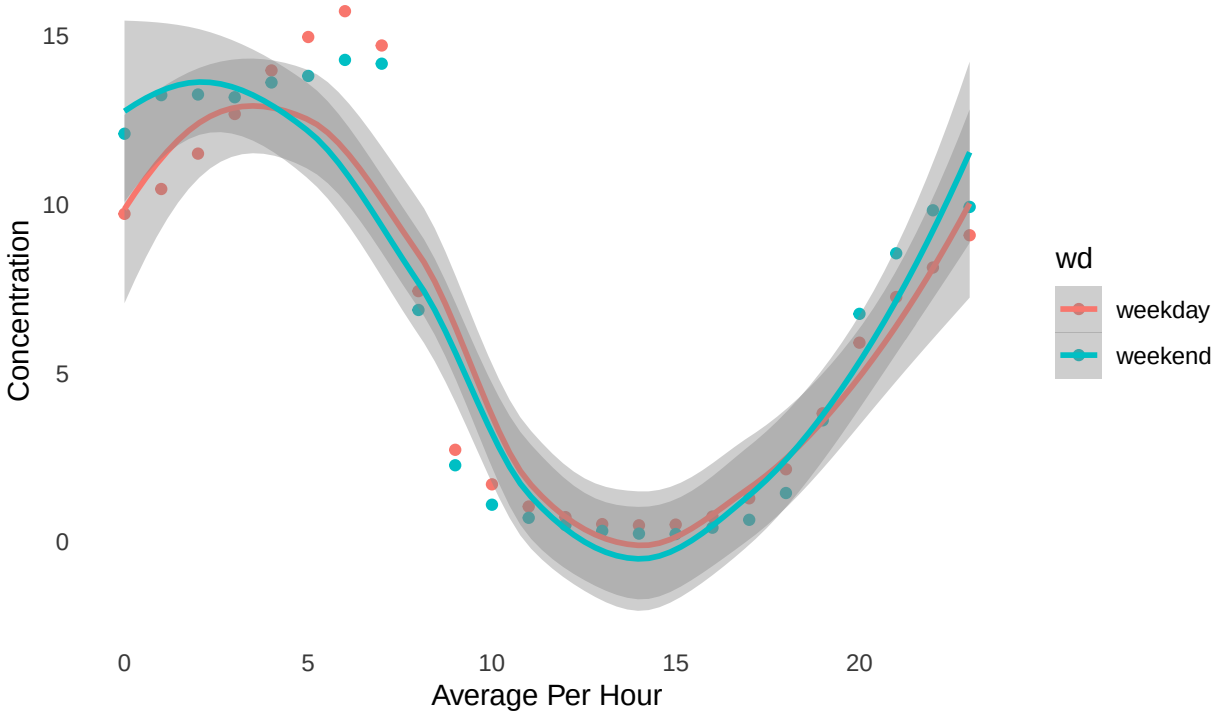
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN398]

July-August 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
July 2022 - August 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-07-01	12.0	19.8	100.0	100.0
2022-07-02	13.7	21.5	100.0	100.0
2022-07-03	16.2	24.7	100.0	100.0
2022-07-04	23.3	30.0	100.0	100.0
2022-07-05	25.7	33.3	100.0	100.0
2022-07-06	22.1	26.0	100.0	100.0
2022-07-07	18.8	22.9	100.0	100.0
2022-07-08	20.6	25.5	100.0	100.0
2022-07-09	21.2	25.9	100.0	100.0
2022-07-10	19.2	24.6	100.0	100.0
2022-07-11	20.5	25.6	100.0	100.0
2022-07-12	21.0	26.6	95.8	95.8
2022-07-13	21.1	26.7	95.8	95.8
2022-07-14	20.5	26.3	100.0	100.0
2022-07-15	20.4	27.7	100.0	100.0
2022-07-16	18.5	23.7	100.0	100.0
2022-07-17	21.2	28.9	100.0	100.0
2022-07-18	19.3	25.7	100.0	100.0
2022-07-19	17.1	24.4	95.8	95.8
2022-07-20	16.6	24.3	100.0	100.0
2022-07-21	13.3	20.3	100.0	100.0
2022-07-22	14.4	20.7	100.0	100.0
2022-07-23	13.3	19.2	100.0	100.0
2022-07-24	14.2	20.2	100.0	100.0
2022-07-25	11.1	18.9	100.0	100.0
2022-07-26	9.3	15.8	100.0	100.0
2022-07-27	11.1	20.6	100.0	100.0
2022-07-28	13.0	20.1	100.0	100.0
2022-07-29	14.3	20.1	100.0	100.0
2022-07-30	16.5	24.4	100.0	100.0
2022-07-31	14.4	21.6	100.0	100.0
2022-08-01	13.1	23.9	100.0	100.0
2022-08-02	13.2	20.1	100.0	100.0
2022-08-03	9.0	13.7	95.8	95.8
2022-08-04	7.1	12.1	100.0	100.0
2022-08-05	12.3	24.4	100.0	100.0
2022-08-06	11.0	18.9	100.0	100.0
2022-08-07	9.2	15.5	100.0	100.0
2022-08-08	9.7	15.5	100.0	100.0
2022-08-09	7.4	12.8	87.5	87.5
2022-08-10	6.3	18.4	100.0	100.0
2022-08-11	6.6	20.9	100.0	100.0
2022-08-12	7.1	12.4	100.0	100.0
2022-08-13	5.8	13.7	100.0	100.0
2022-08-14	6.7	11.9	100.0	100.0

(continued)

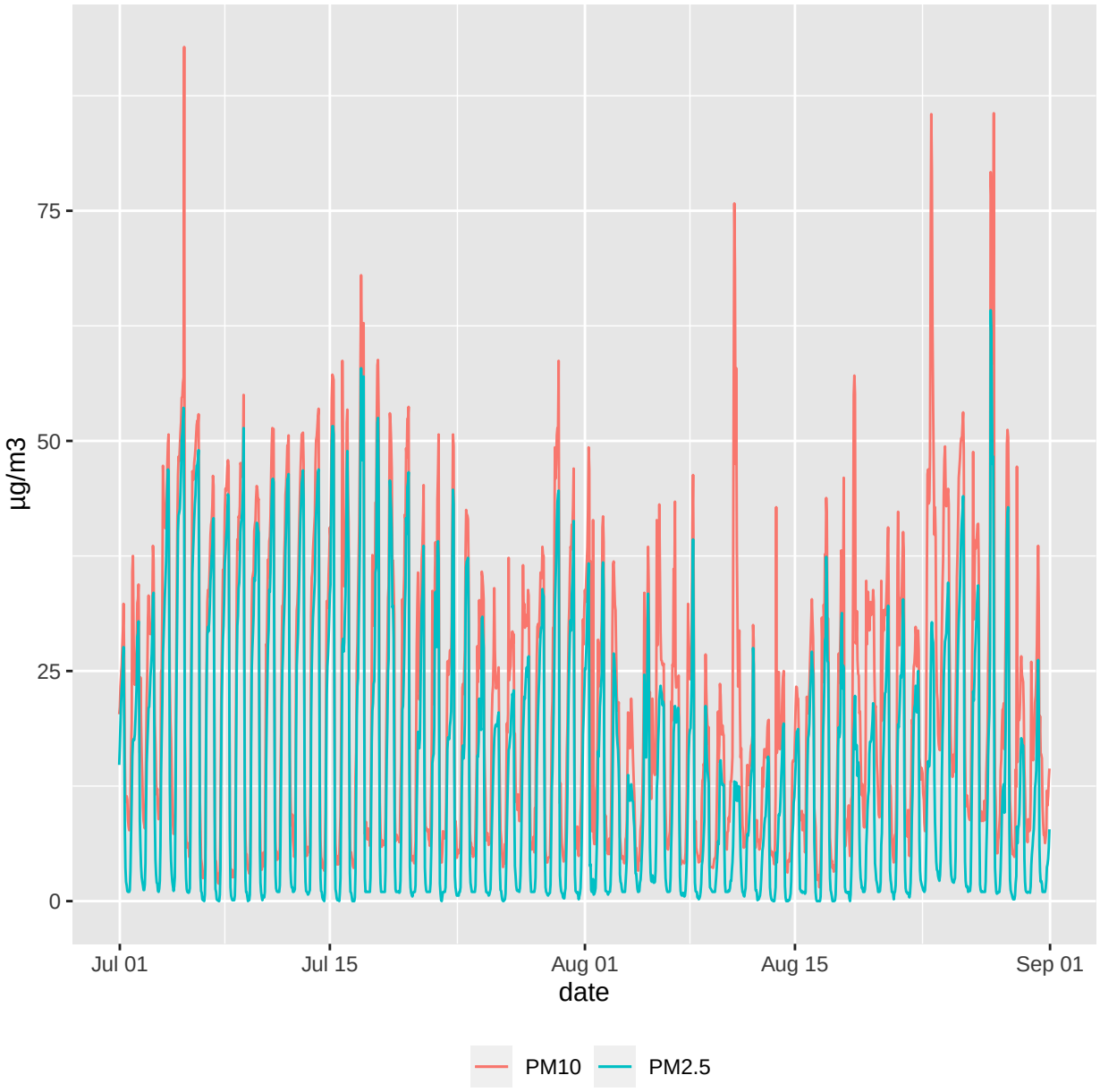
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-08-15	9.1	15.3	100.0	100.0
2022-08-16	11.4	16.7	91.7	91.7
2022-08-17	11.9	17.2	100.0	100.0
2022-08-18	10.9	21.8	100.0	100.0
2022-08-19	8.5	23.1	100.0	100.0
2022-08-20	9.9	23.4	100.0	100.0
2022-08-21	12.3	21.0	100.0	100.0
2022-08-22	12.3	19.9	100.0	100.0
2022-08-23	10.6	23.7	100.0	100.0
2022-08-24	14.4	39.5	100.0	100.0
2022-08-25	16.5	30.3	95.8	95.8
2022-08-26	17.2	28.1	100.0	100.0
2022-08-27	13.1	21.7	100.0	100.0
2022-08-28	17.8	29.1	100.0	100.0
2022-08-29	11.7	22.0	91.7	91.7
2022-08-30	6.9	15.9	100.0	100.0
2022-08-31	7.4	16.7	100.0	100.0

Monthly Average

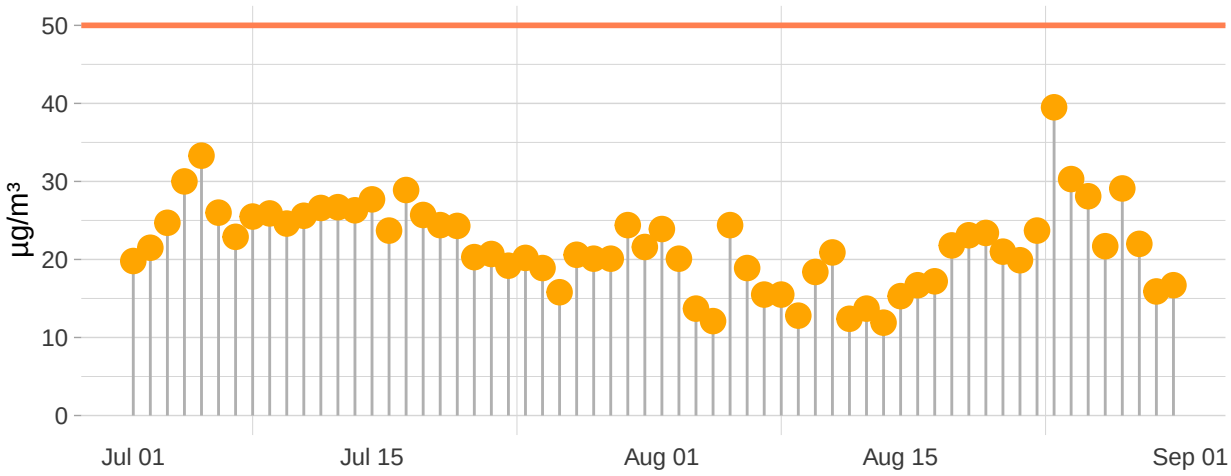
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
July 2022	17.22258	23.74194	99.59355	99.59355
August 2022	10.52903	19.98710	98.79032	98.79032

NA - Not enough data to calculate averages

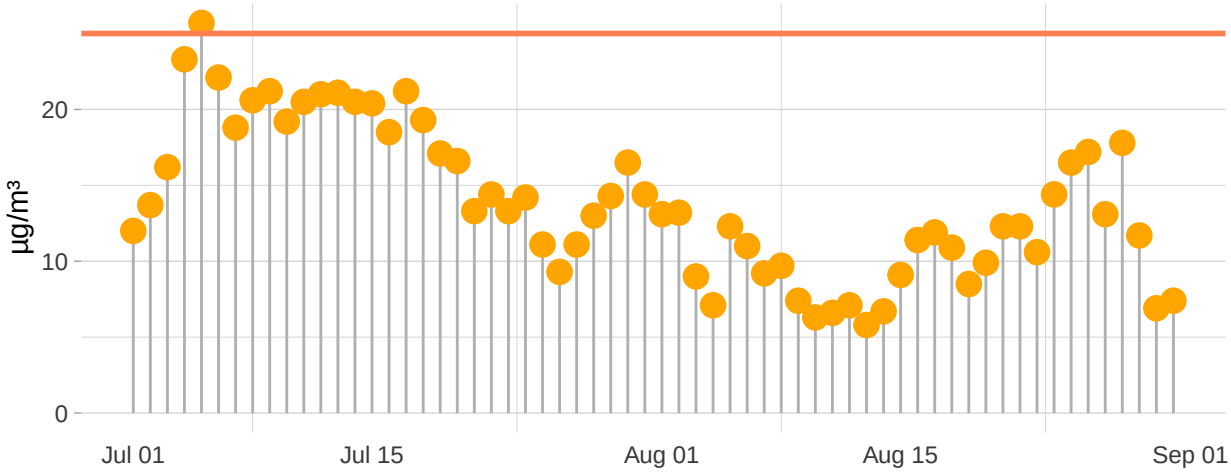
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

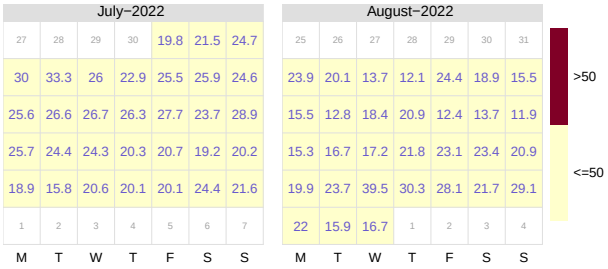


BENNETT RESOURCES

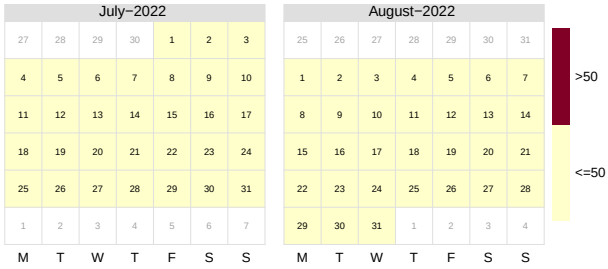
SITE: Ben398
Bi-Monthly Report
July 2022 - August 2022

Daily Exceedances

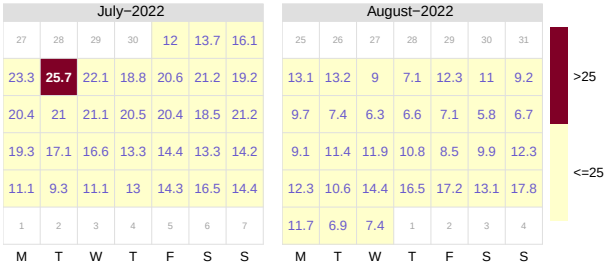
PM_{10}. Daily Exceedances at Ben398



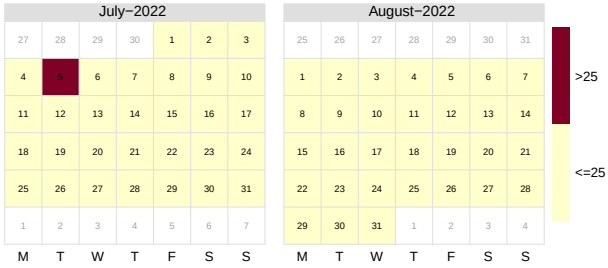
PM_{10}. Days with Exceedances at Ben398



$PM_{2.5}$. Daily Exceedances at Ben398



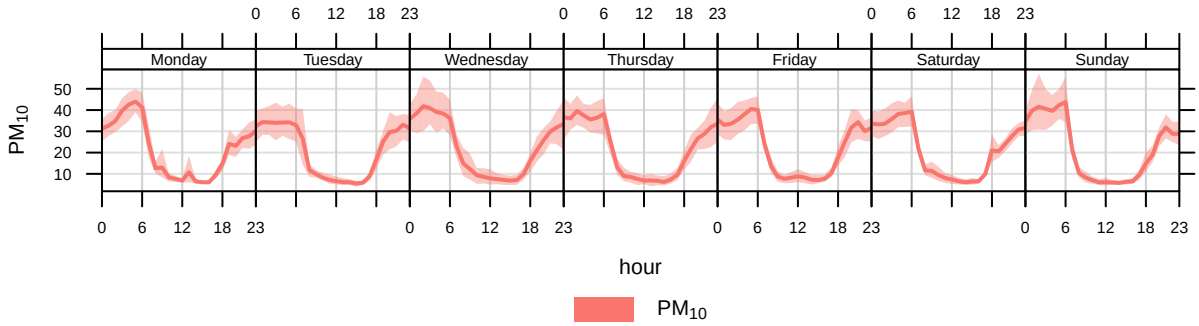
$PM_{2.5}$. Days with Exceedances at Ben398

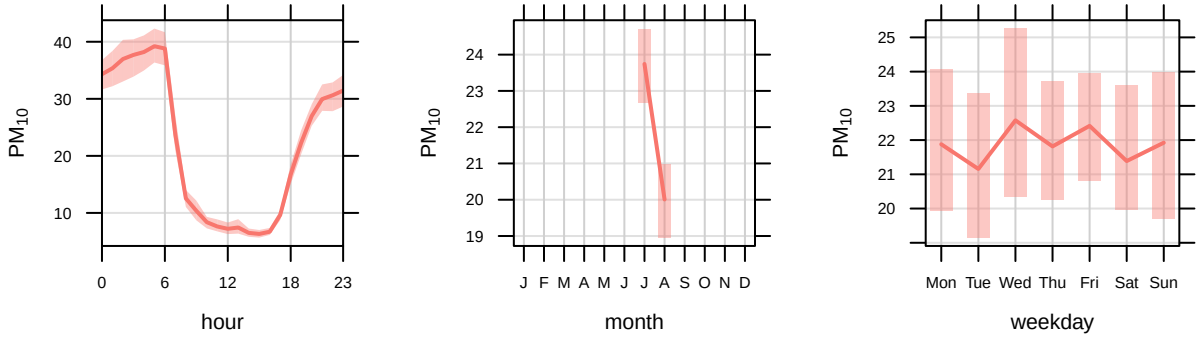


BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
July 2022 - August 2022

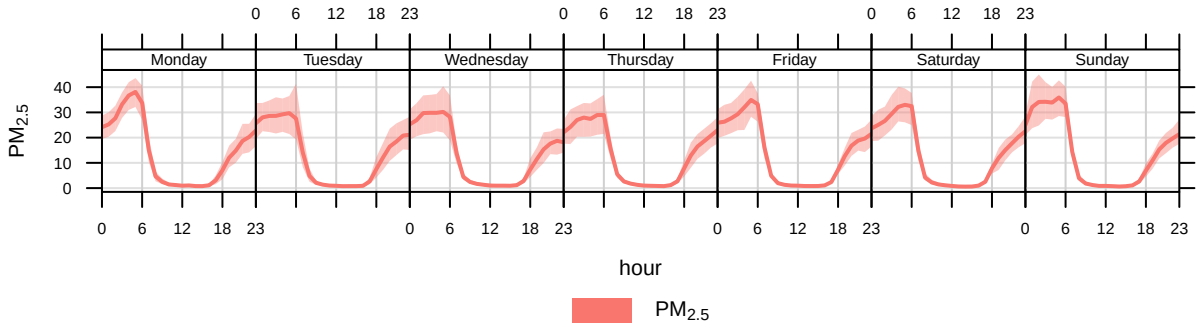
PM_{10} Time variation at Ben398

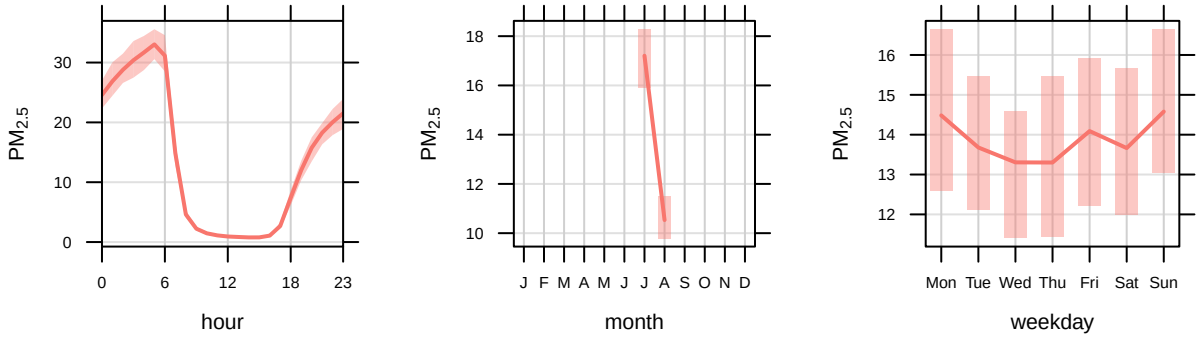




mean and 95% confidence interval in mean

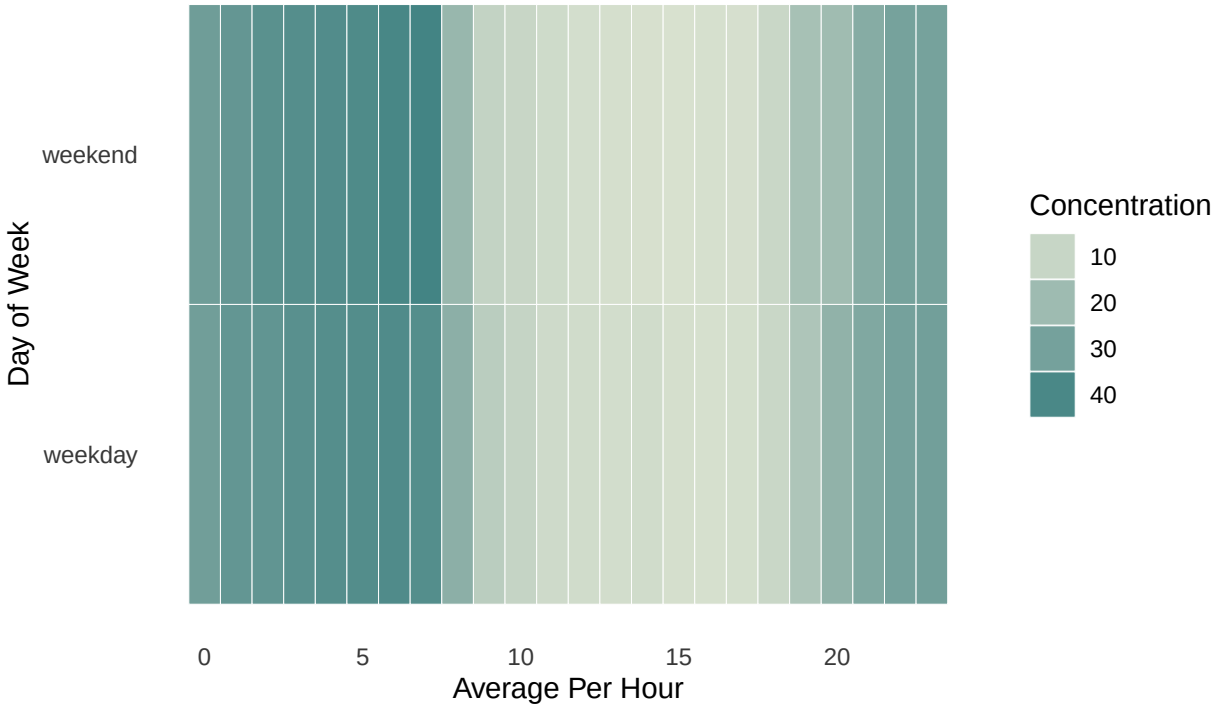
$PM_{2.5}$ Time variation at Ben398



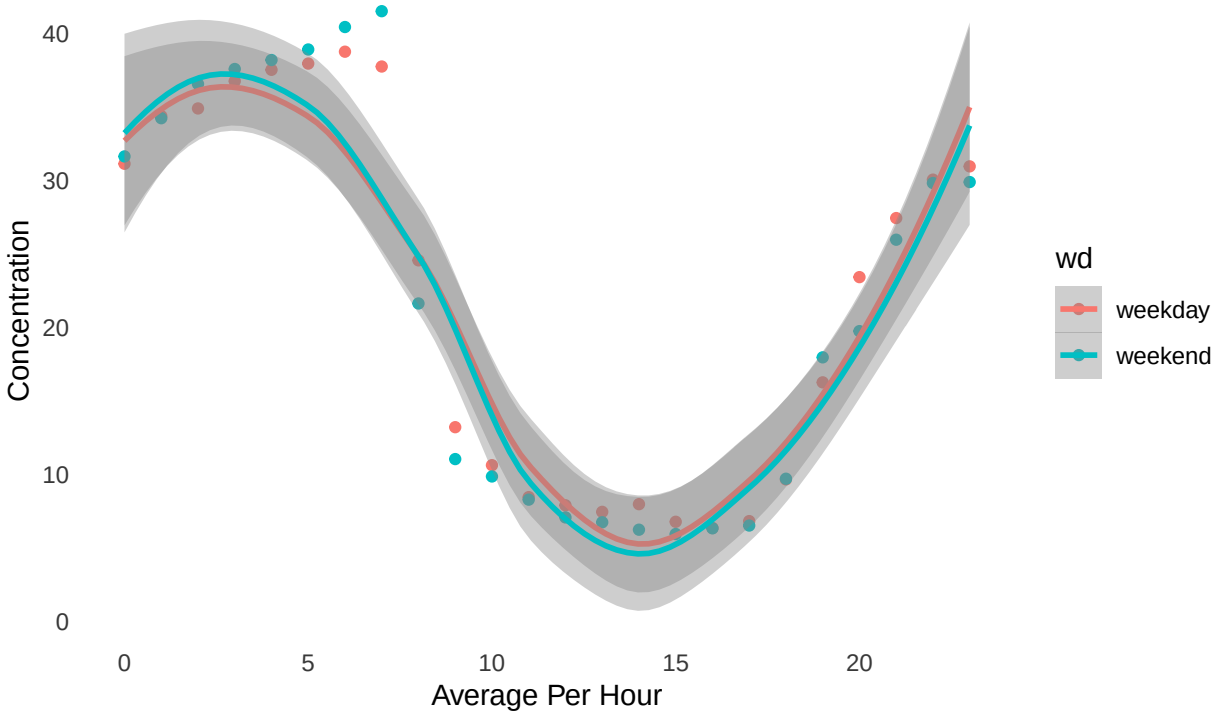


mean and 95% confidence interval in mean

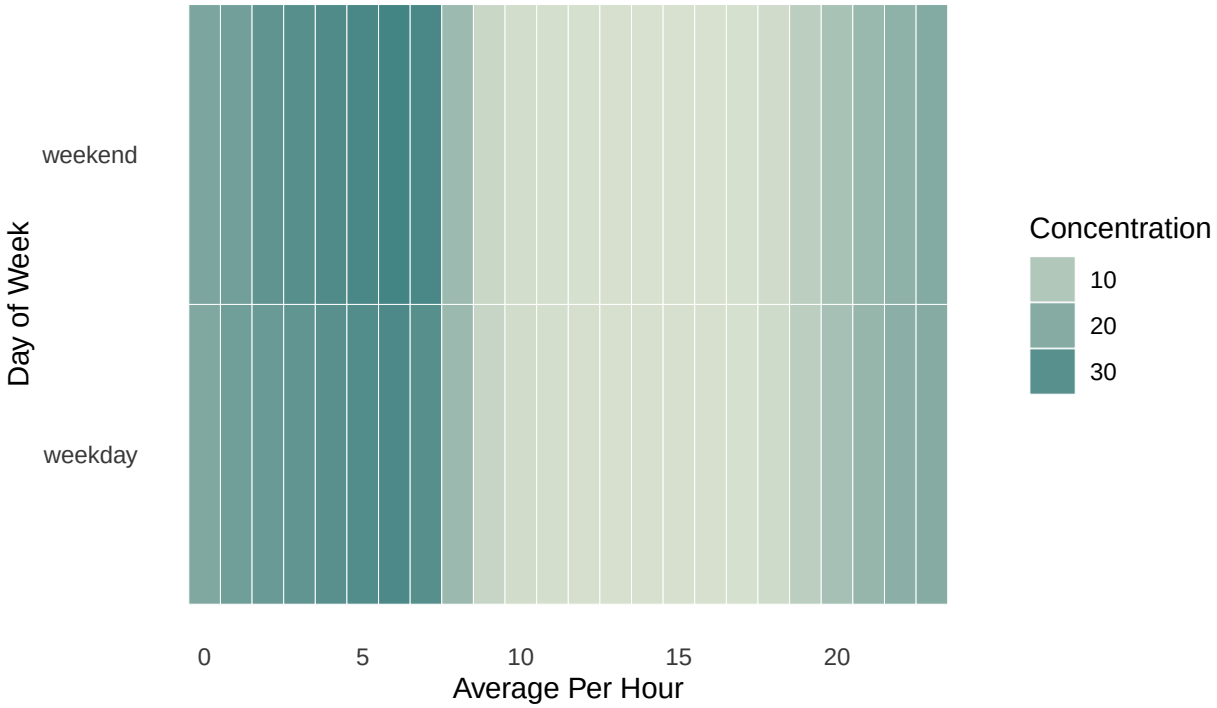
PM10 concentration by Weekday/weekend and Hour



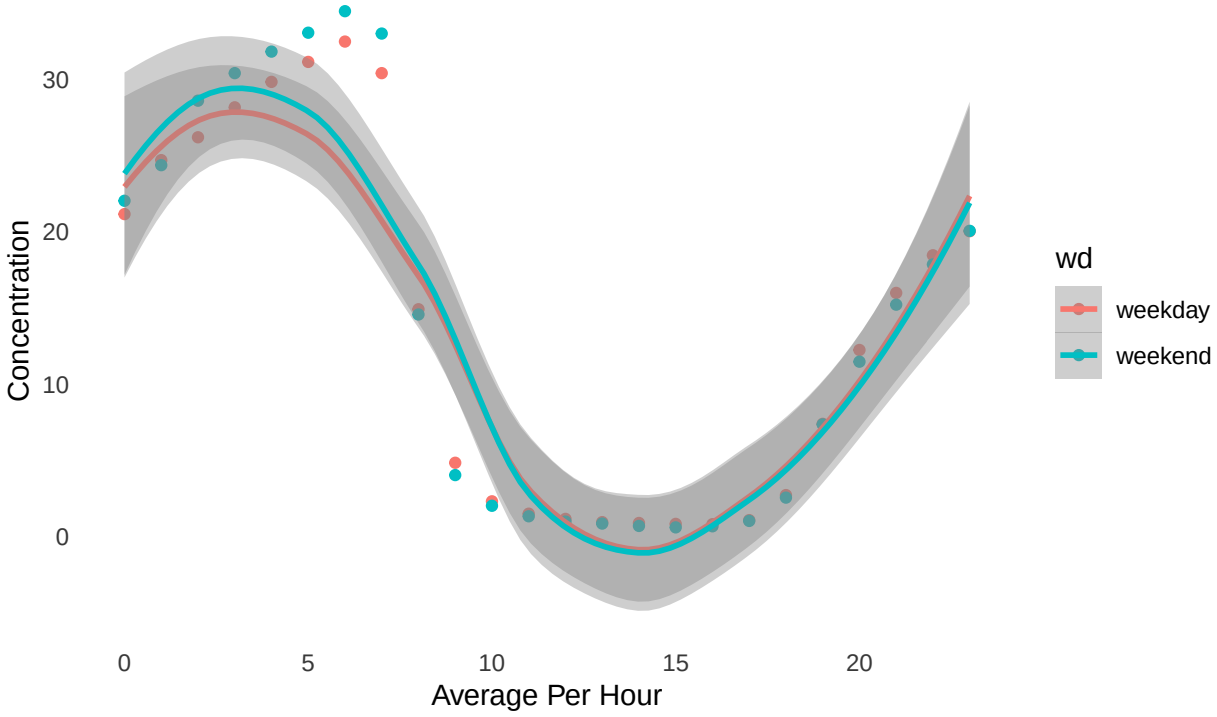
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN398]

September-October 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
September 2022 - October 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-09-01	5.1	12.2	83.3	83.3
2022-09-02	4.6	10.9	100.0	100.0
2022-09-03	3.1	8.2	100.0	100.0
2022-09-04	3.5	7.6	100.0	100.0
2022-09-05	4.3	7.5	100.0	100.0
2022-09-06	5.6	9.4	100.0	100.0
2022-09-07	5.4	9.5	100.0	100.0
2022-09-08	7.6	12.0	100.0	100.0
2022-09-09	7.6	11.5	100.0	100.0
2022-09-10	6.0	10.2	100.0	100.0
2022-09-11	6.9	10.4	100.0	100.0
2022-09-12	5.6	9.8	100.0	100.0
2022-09-13	6.4	11.4	100.0	100.0
2022-09-14	5.6	10.1	95.8	95.8
2022-09-15	4.7	11.8	100.0	100.0
2022-09-16	4.6	10.5	100.0	100.0
2022-09-17	4.9	10.2	100.0	100.0
2022-09-18	6.5	13.4	100.0	100.0
2022-09-19	5.5	12.2	100.0	100.0
2022-09-20	9.2	23.9	100.0	100.0
2022-09-21	4.0	12.9	100.0	100.0
2022-09-22	4.0	13.6	95.8	95.8
2022-09-23	4.8	12.0	100.0	100.0
2022-09-24	4.8	10.1	100.0	100.0
2022-09-25	4.7	11.5	100.0	100.0
2022-09-26	5.8	13.4	100.0	100.0
2022-09-27	4.7	12.7	100.0	100.0
2022-09-28	5.0	11.0	100.0	100.0
2022-09-29	4.8	9.6	100.0	100.0
2022-09-30	4.2	7.6	100.0	100.0
2022-10-01	2.7	5.2	91.7	91.7
2022-10-02	NA	NA	NA	NA
2022-10-03	5.1	9.0	100.0	100.0
2022-10-04	4.5	7.2	100.0	100.0
2022-10-05	4.2	6.4	100.0	100.0
2022-10-06	3.9	6.2	100.0	100.0
2022-10-07	2.4	4.6	100.0	100.0
2022-10-08	2.7	7.1	100.0	100.0
2022-10-09	2.8	8.0	100.0	100.0
2022-10-10	3.4	9.2	100.0	100.0
2022-10-11	3.5	7.7	87.5	87.5
2022-10-12	5.1	10.1	75.0	75.0
2022-10-13	7.2	19.0	100.0	100.0
2022-10-14	4.6	11.2	100.0	100.0
2022-10-15	4.3	10.3	100.0	100.0

(continued)

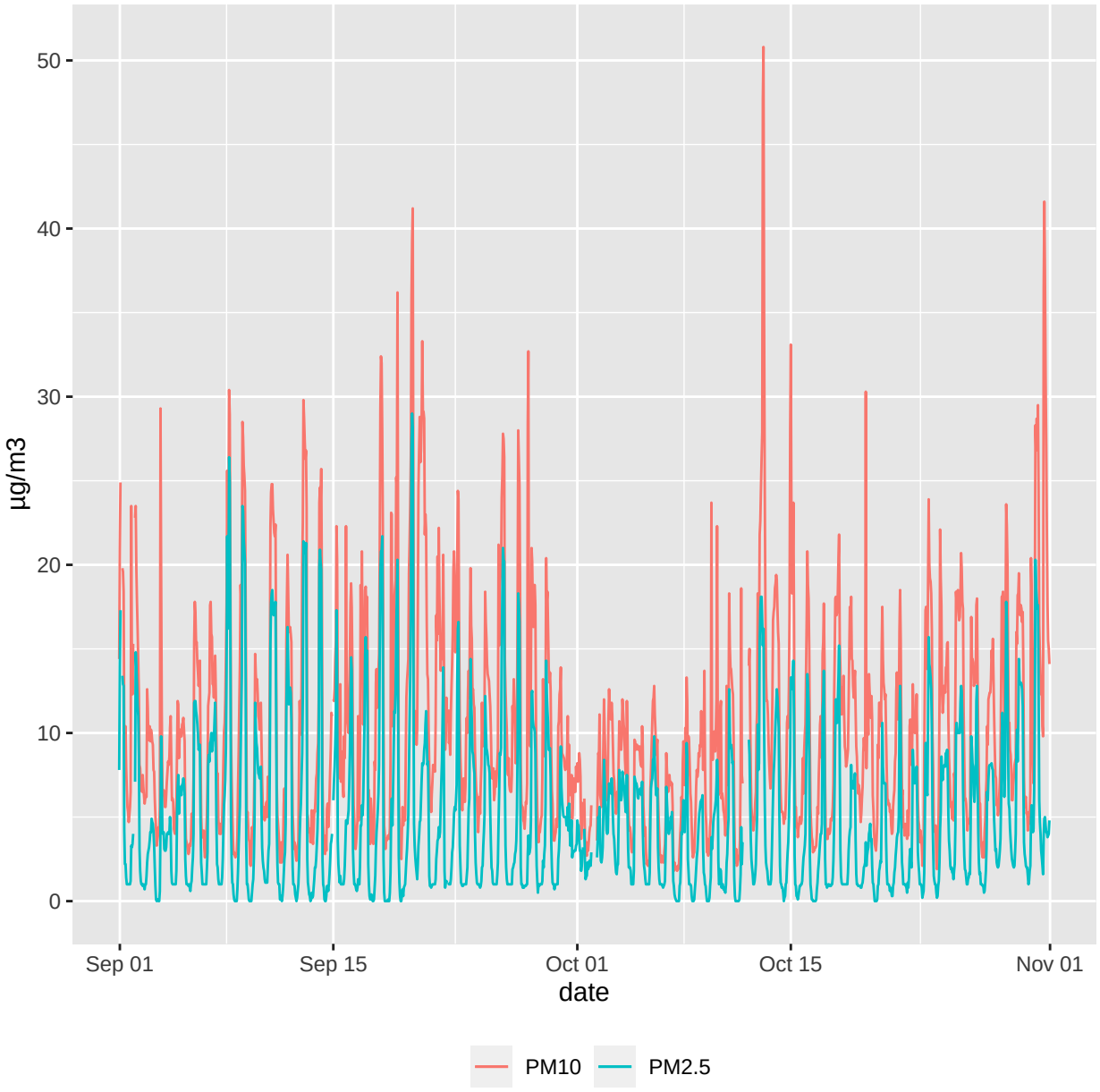
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-10-16	3.6	8.4	100.0	100.0
2022-10-17	4.4	8.7	100.0	100.0
2022-10-18	4.6	13.6	100.0	100.0
2022-10-19	2.9	10.0	100.0	100.0
2022-10-20	2.1	9.0	100.0	100.0
2022-10-21	3.1	8.7	100.0	100.0
2022-10-22	3.3	8.3	100.0	100.0
2022-10-23	4.6	8.8	100.0	100.0
2022-10-24	5.9	11.7	100.0	100.0
2022-10-25	5.7	11.2	100.0	100.0
2022-10-26	6.0	11.8	100.0	100.0
2022-10-27	4.1	8.5	100.0	100.0
2022-10-28	5.8	11.2	100.0	100.0
2022-10-29	7.3	12.7	100.0	100.0
2022-10-30	5.7	10.7	100.0	100.0
2022-10-31	7.6	22.1	100.0	100.0

Monthly Average

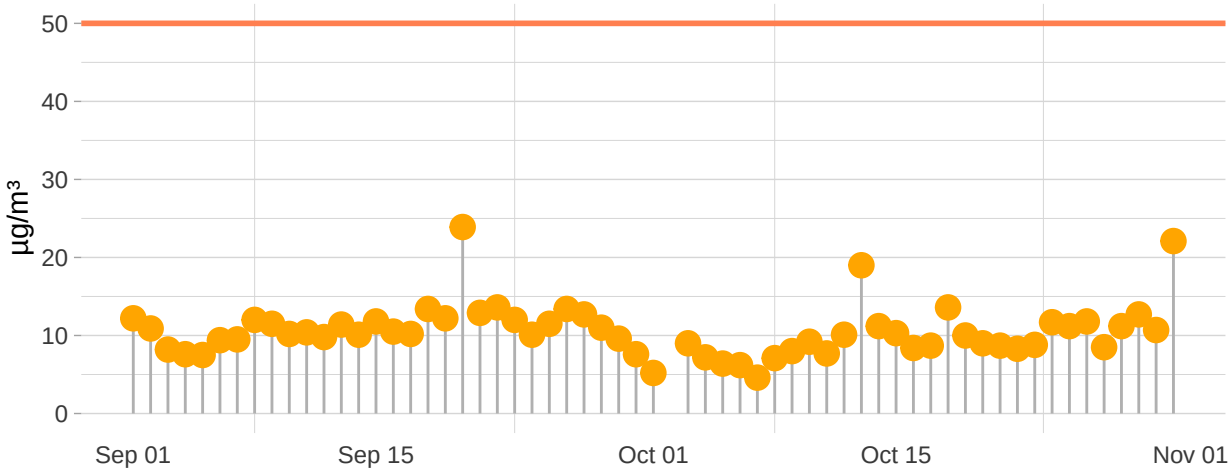
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
September 2022	5.316667	11.236667	99.16333	99.16333
October 2022	4.436667	9.886667	98.47333	98.47333

NA - Not enough data to calculate averages

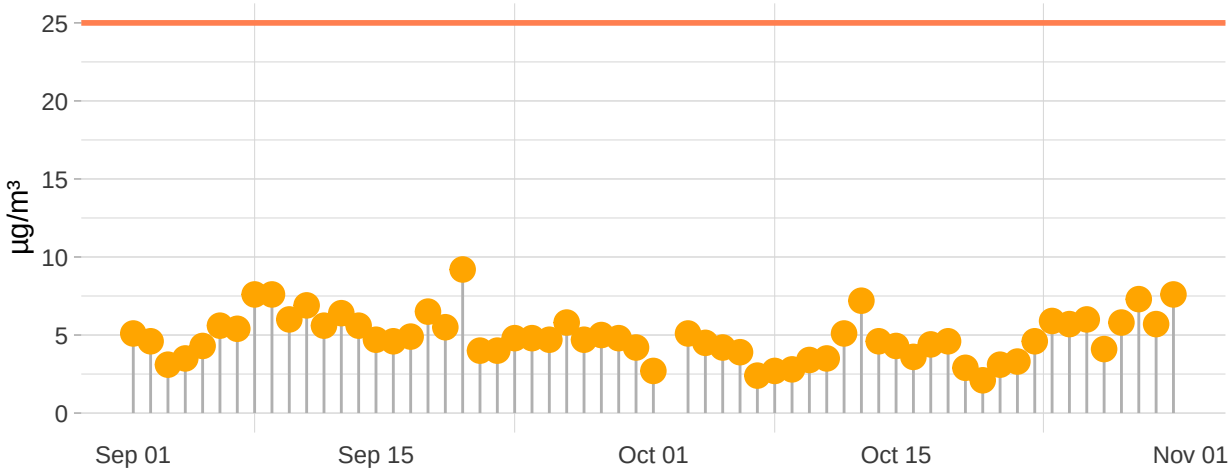
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

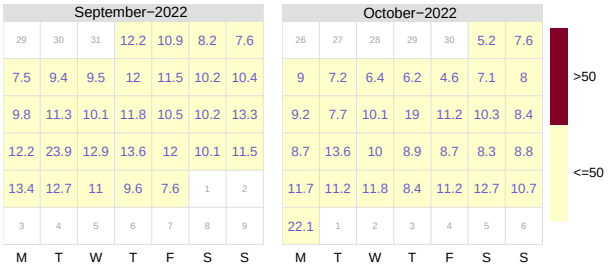


BENNETT RESOURCES

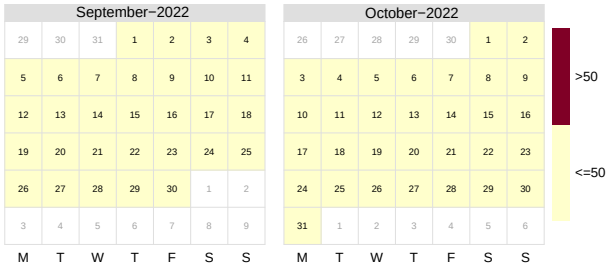
SITE: Ben398
Bi-Monthly Report
September 2022 - October 2022

Daily Exceedances

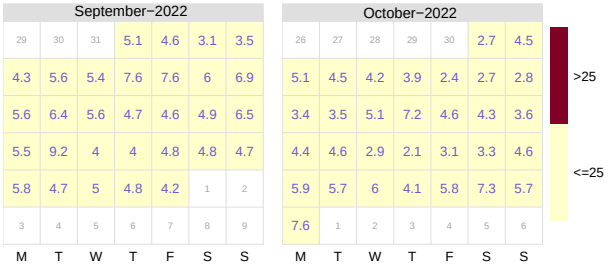
PM_{10}. Daily Exceedances at Ben398



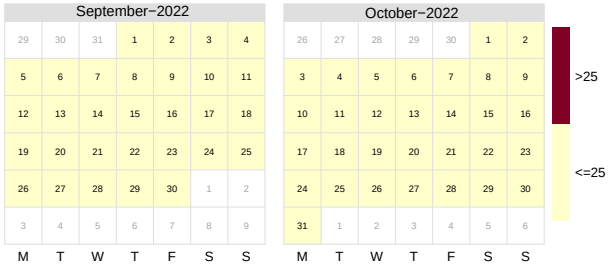
PM_{10}. Days with Exceedances at Ben398



$PM_{2.5}$. Daily Exceedances at Ben398



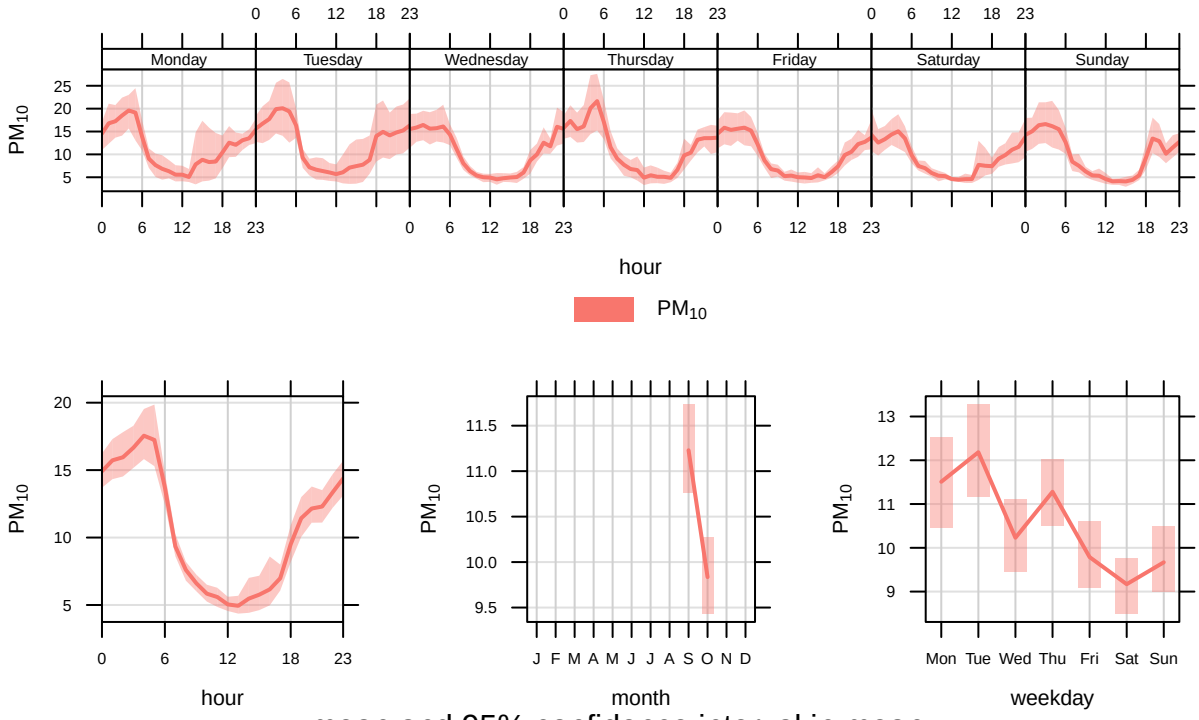
$PM_{2.5}$. Days with Exceedances at Ben398



BENNETT RESOURCES

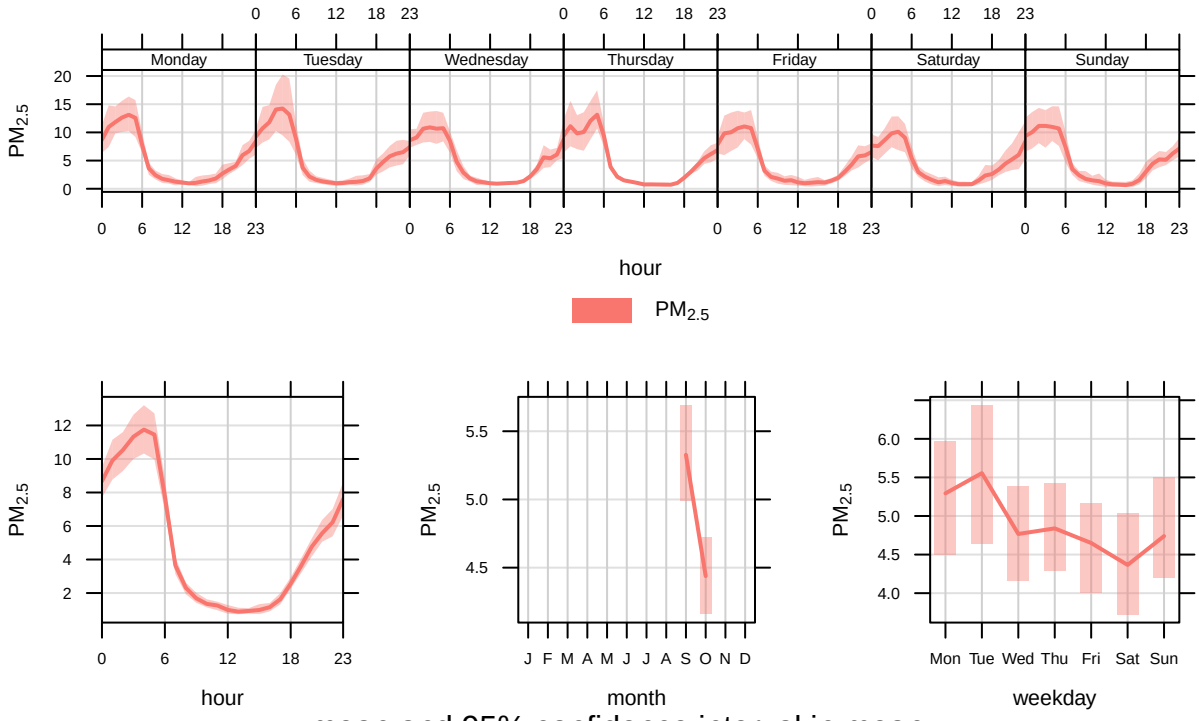
SITE: Ben398
Bi-Monthly Report
September 2022 - October 2022

PM_{10} Time variation at Ben398



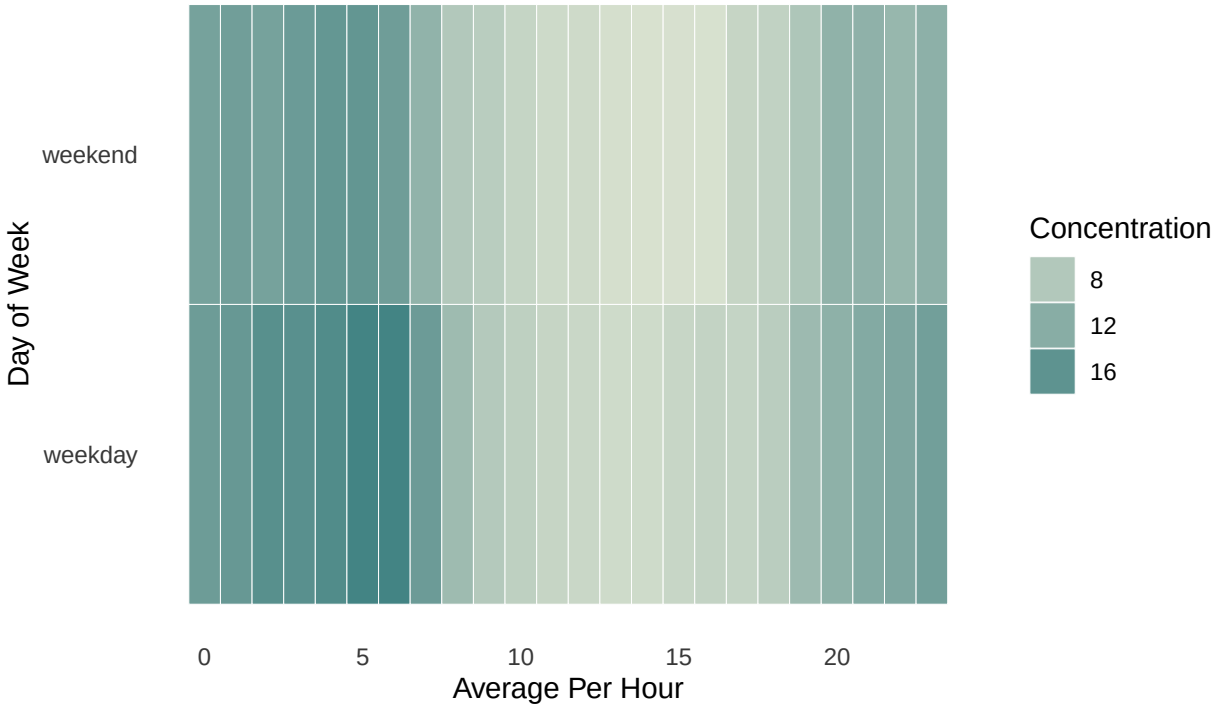
mean and 95% confidence interval in mean

$PM_{2.5}$ Time variation at Ben398

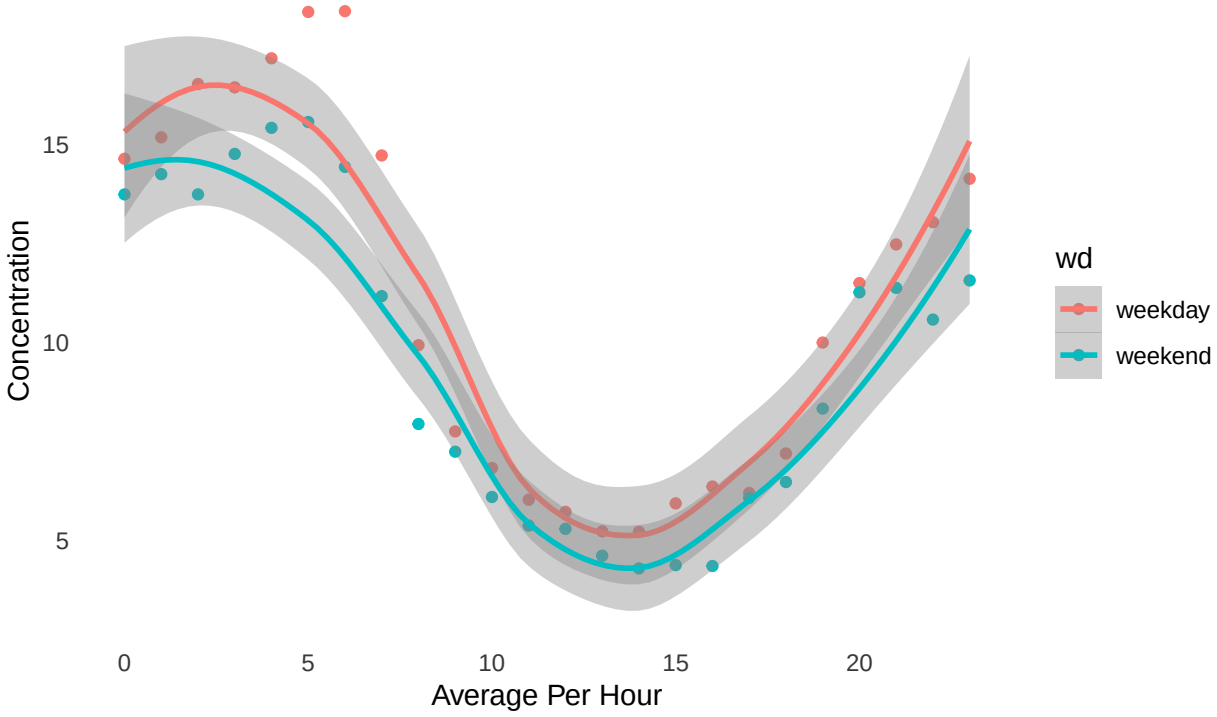


mean and 95% confidence interval in mean

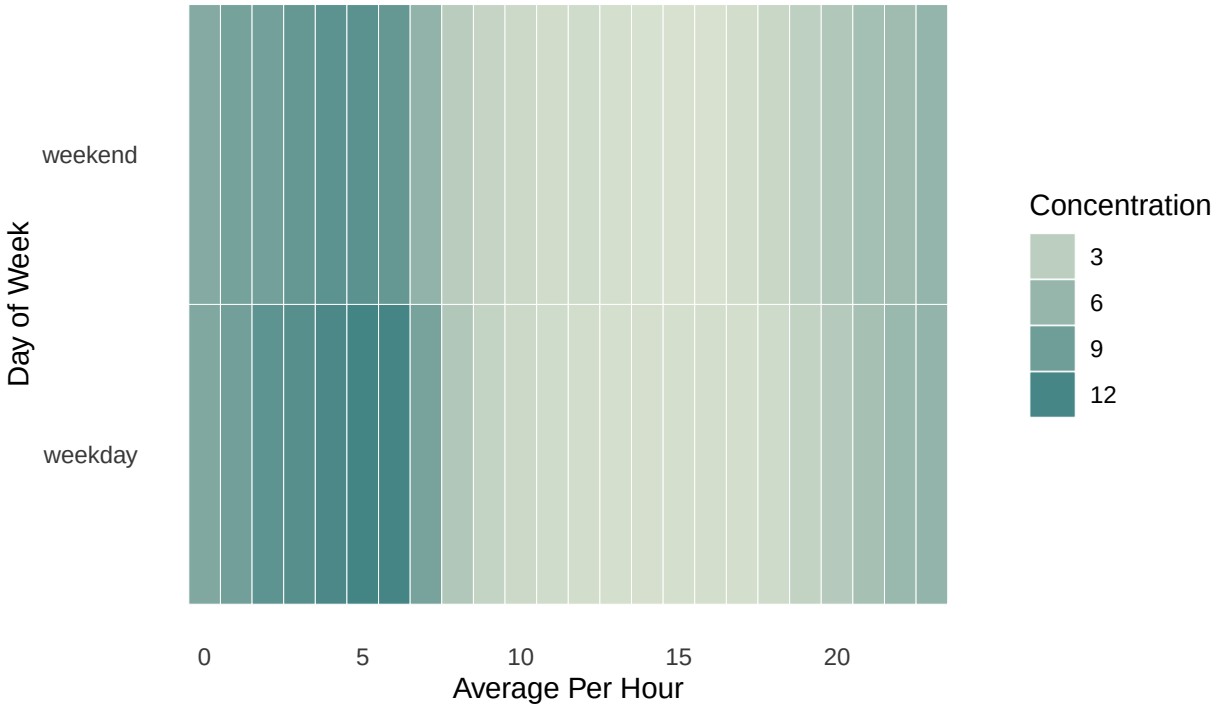
PM10 concentration by Weekday/weekend and Hour



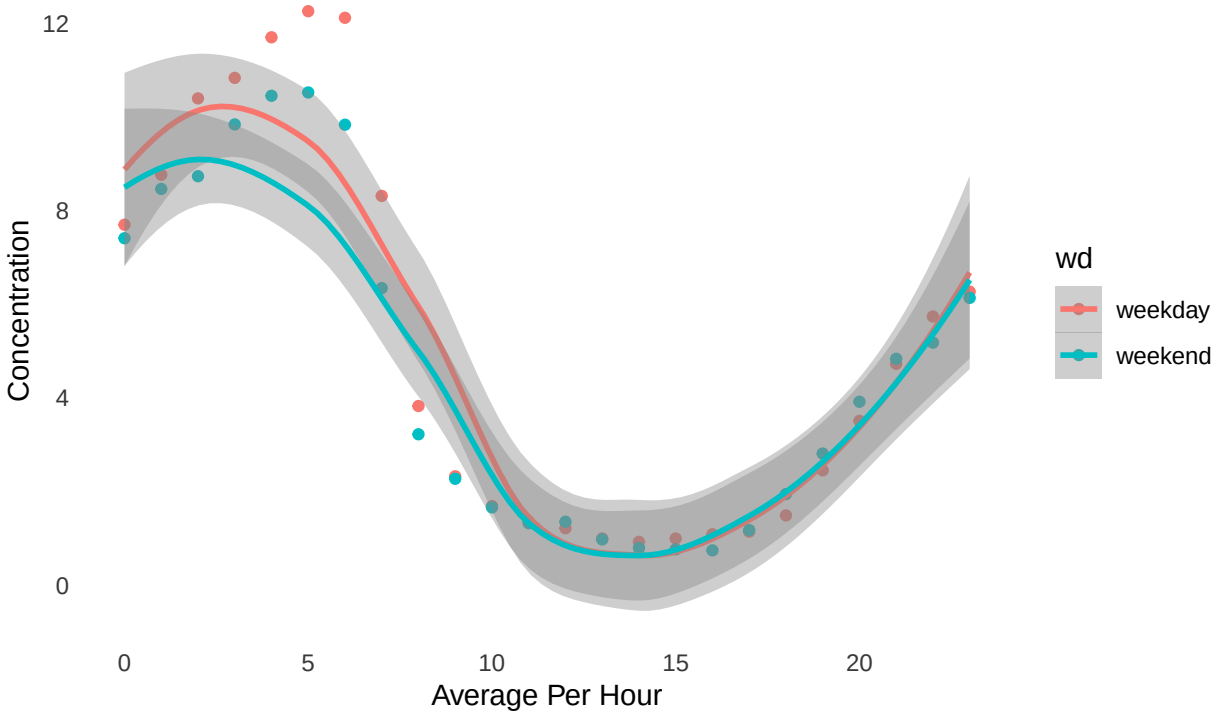
PM10 concentration by weekday and weekend with trend



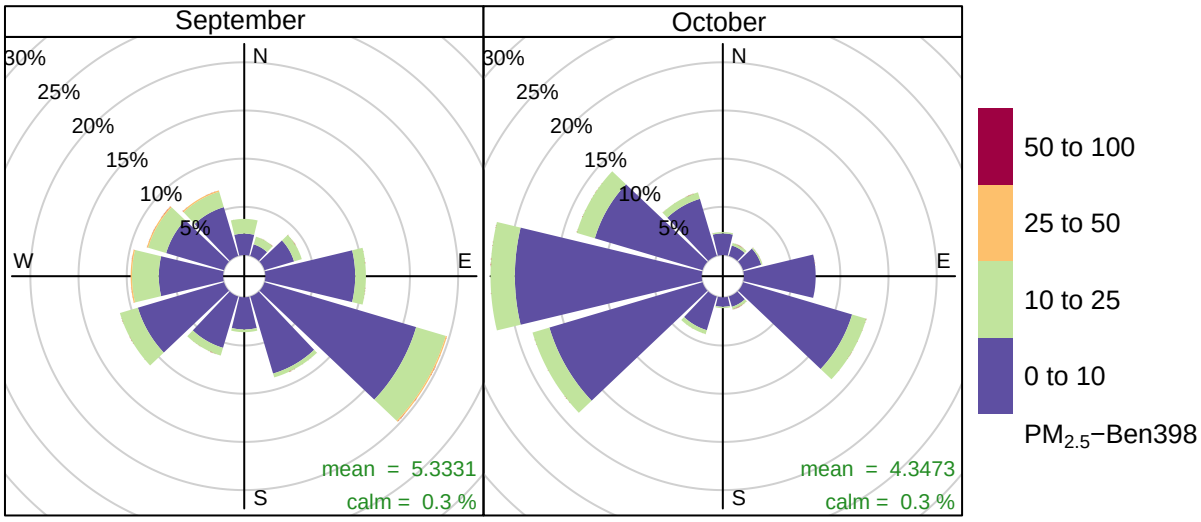
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

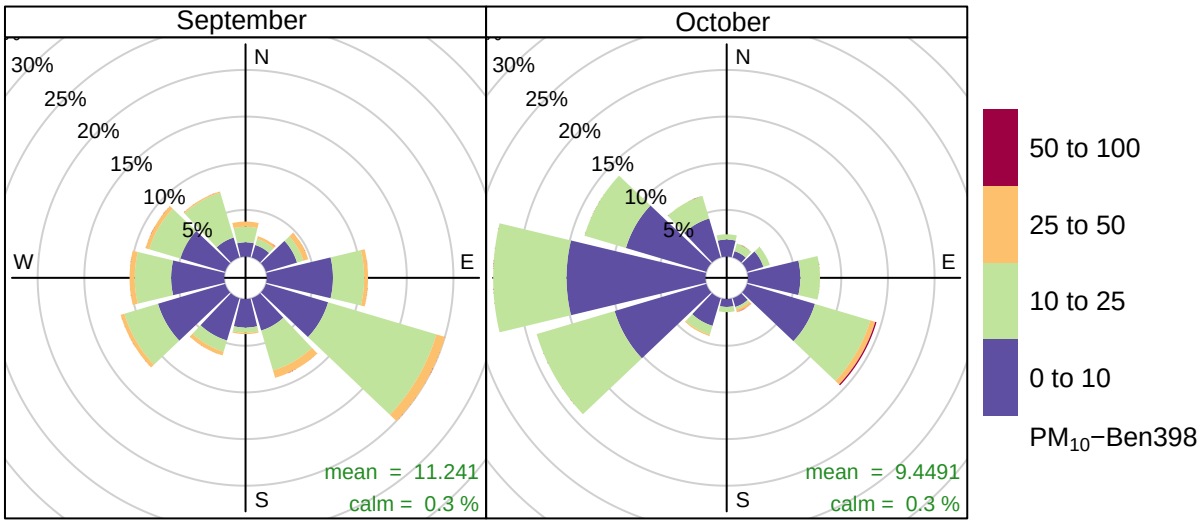


$PM_{2.5}$ pollution rose at Ben398



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben398



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN398]

November 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
November 2022 - November 2022

Daily Averages

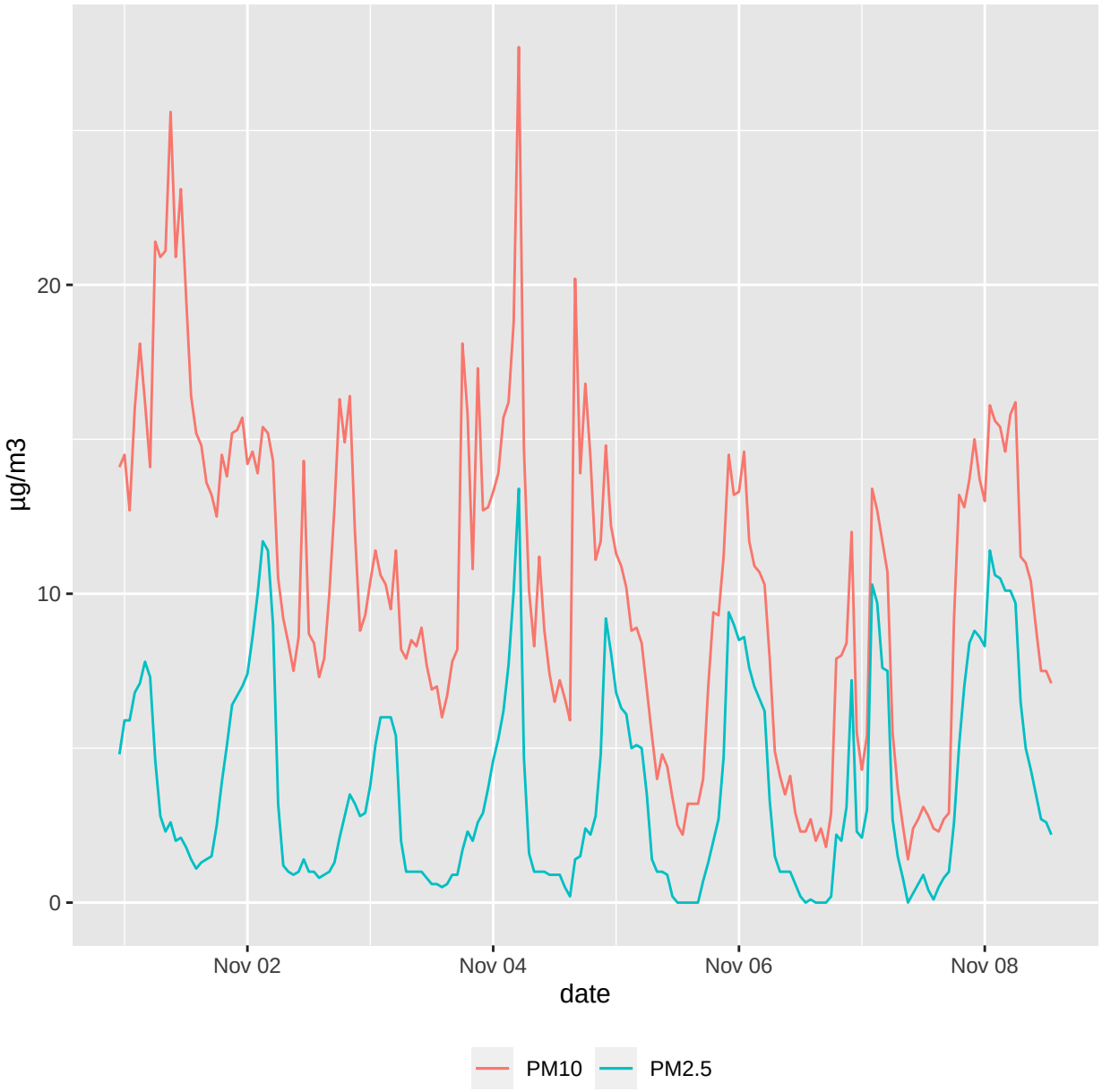
	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-11-01	4.1	16.9	100.0	100.0
2022-11-02	3.8	11.6	100.0	100.0
2022-11-03	2.4	10.1	100.0	100.0
2022-11-04	3.9	12.8	100.0	100.0
2022-11-05	3.0	7.1	100.0	100.0
2022-11-06	2.9	6.5	100.0	100.0
2022-11-07	3.8	7.1	100.0	100.0
2022-11-08	NA	NA	58.3	58.3

Monthly Average

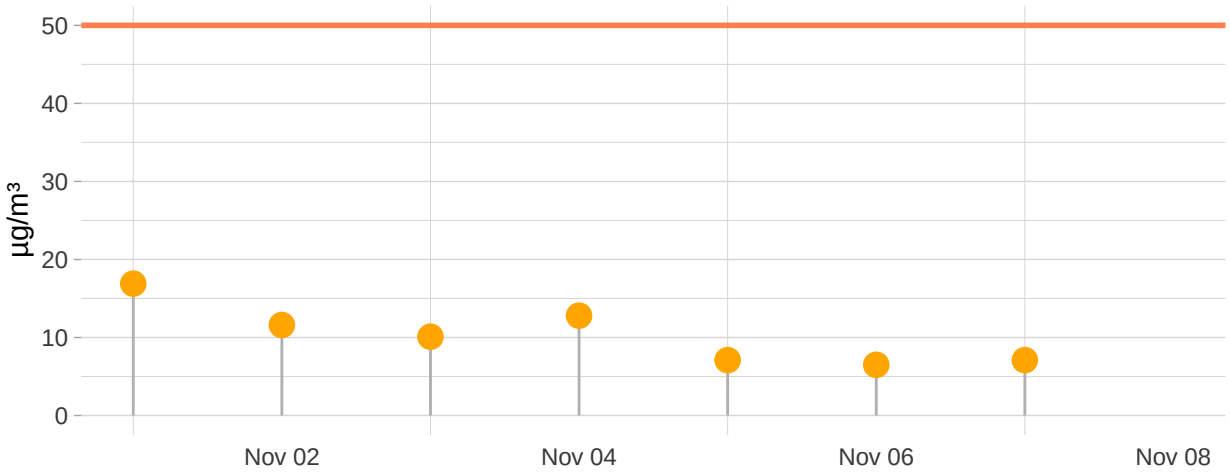
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
November 2022	NA	NA	NA	NA

NA - Not enough data to calculate averages

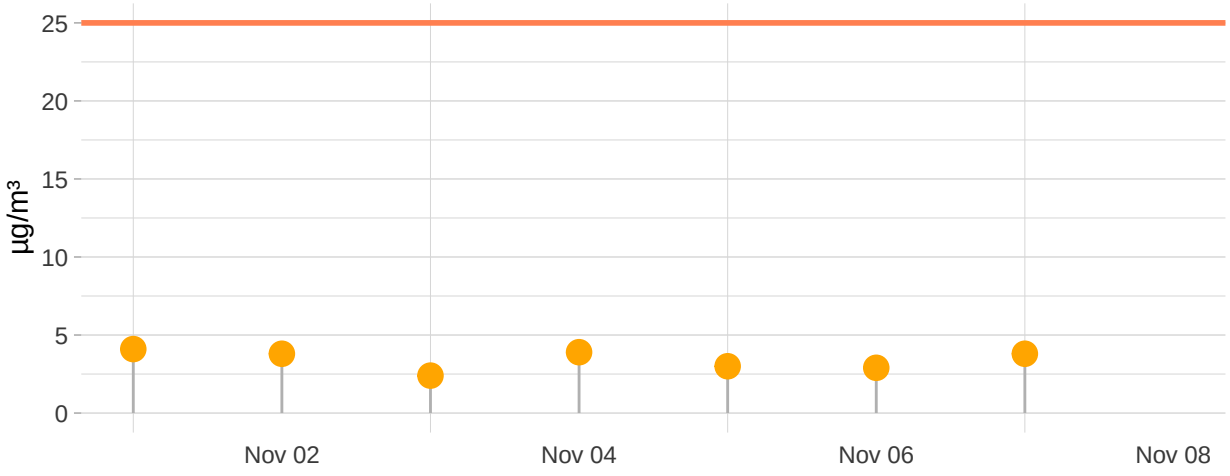
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

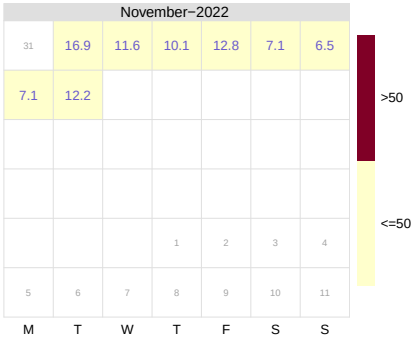


BENNETT RESOURCES

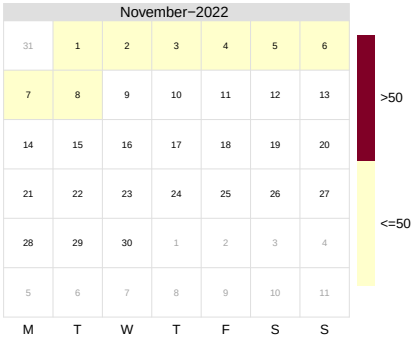
SITE: Ben398
Bi-Monthly Report
November 2022 - November 2022

Daily Exceedances

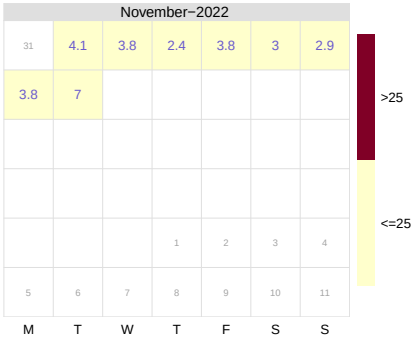
PM_{10}. Daily Exceedances at Ben398



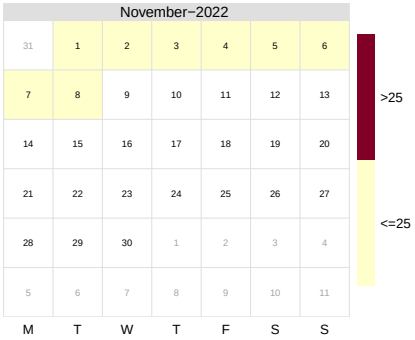
PM_{10}. Days with Exceedances at Ben398



$PM_{2.5}$. Daily Exceedances at Ben398



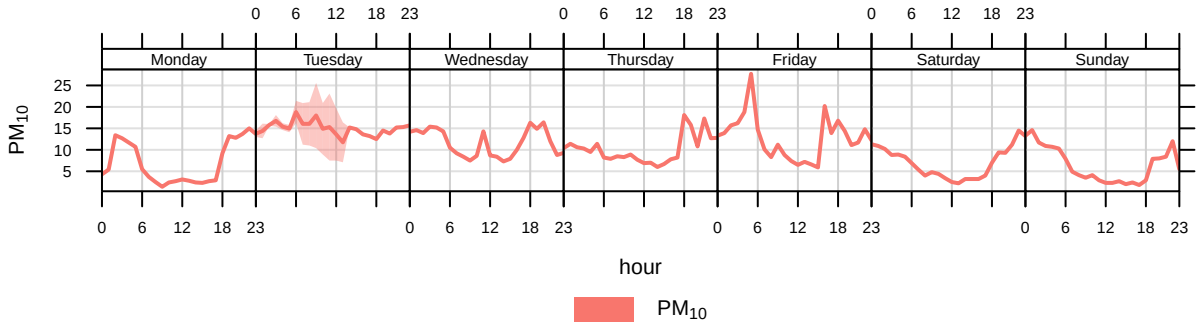
$PM_{2.5}$. Days with Exceedances at Ben398

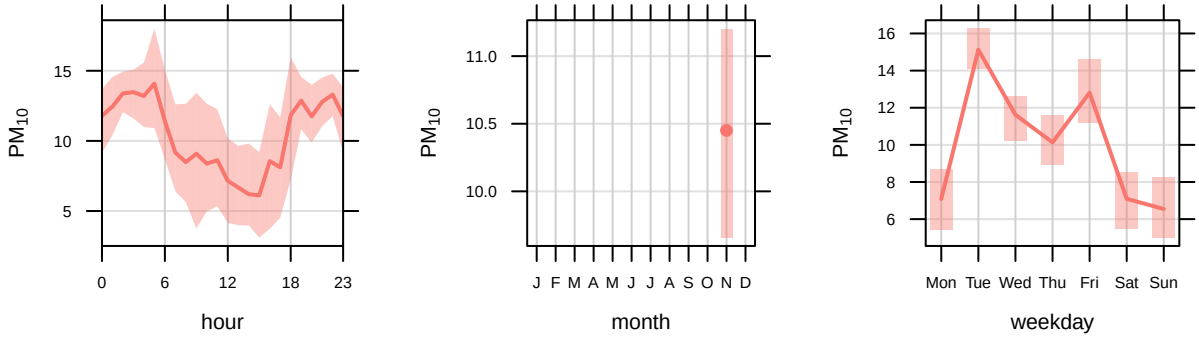


BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
November 2022 - November 2022

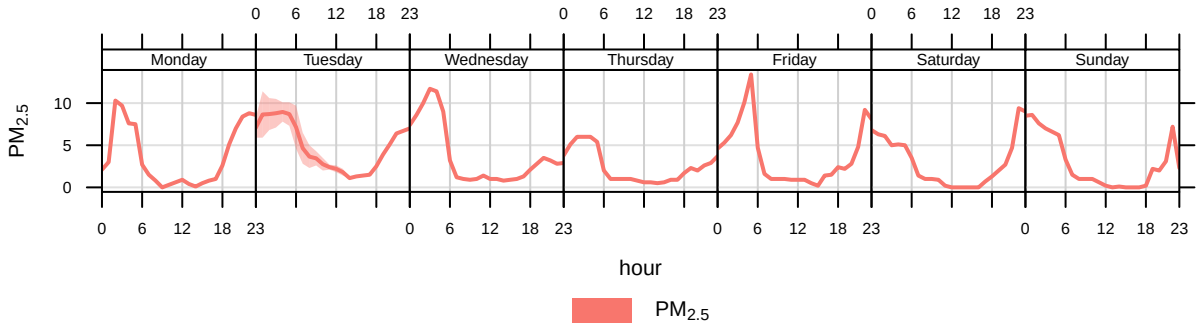
PM_{10} Time variation at Ben398

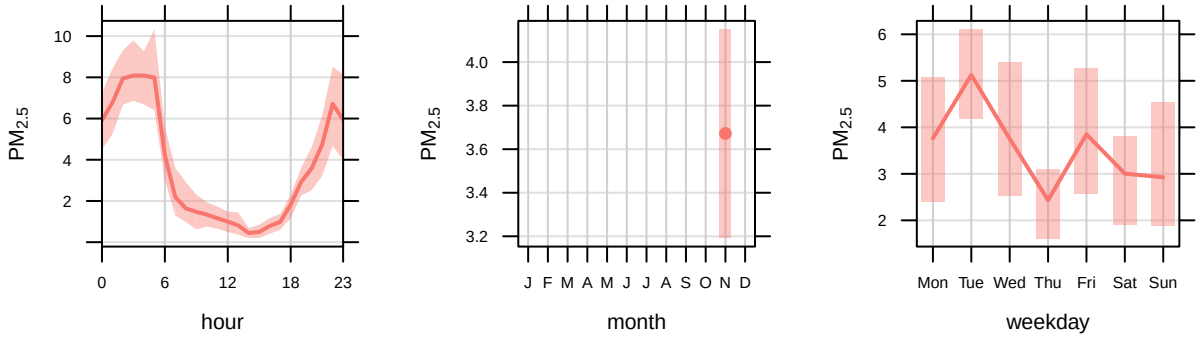




mean and 95% confidence interval in mean

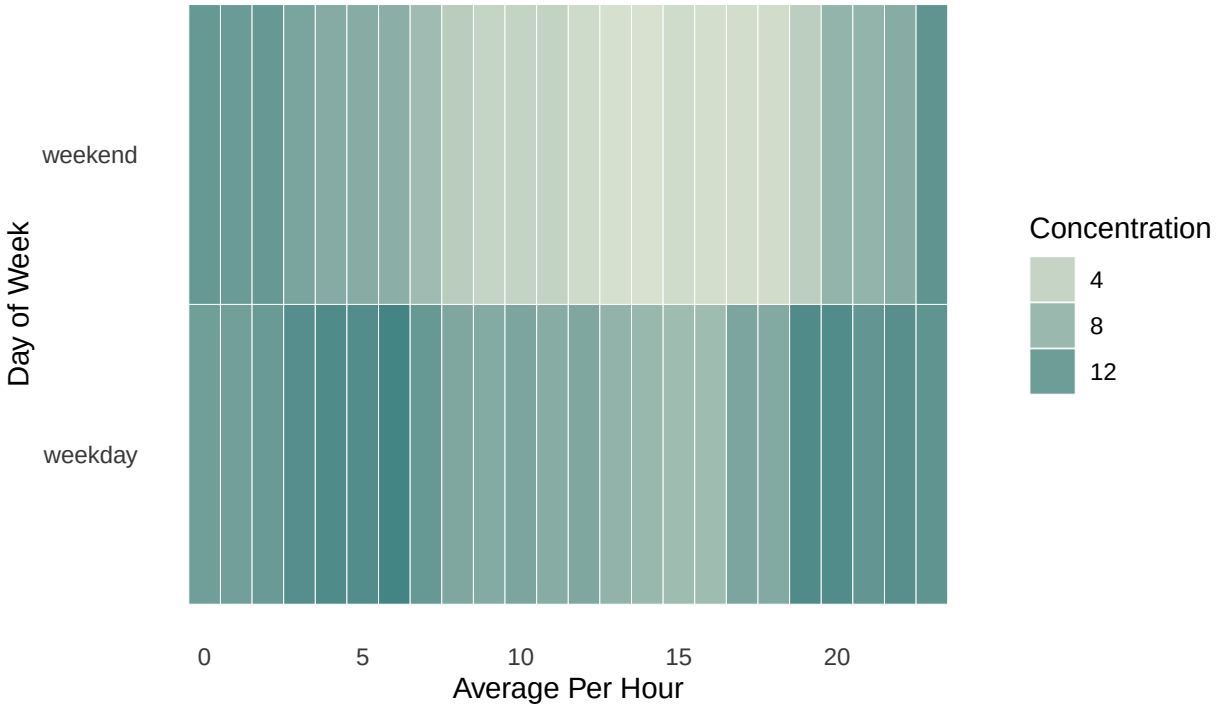
$PM_{2.5}$ Time variation at Ben398



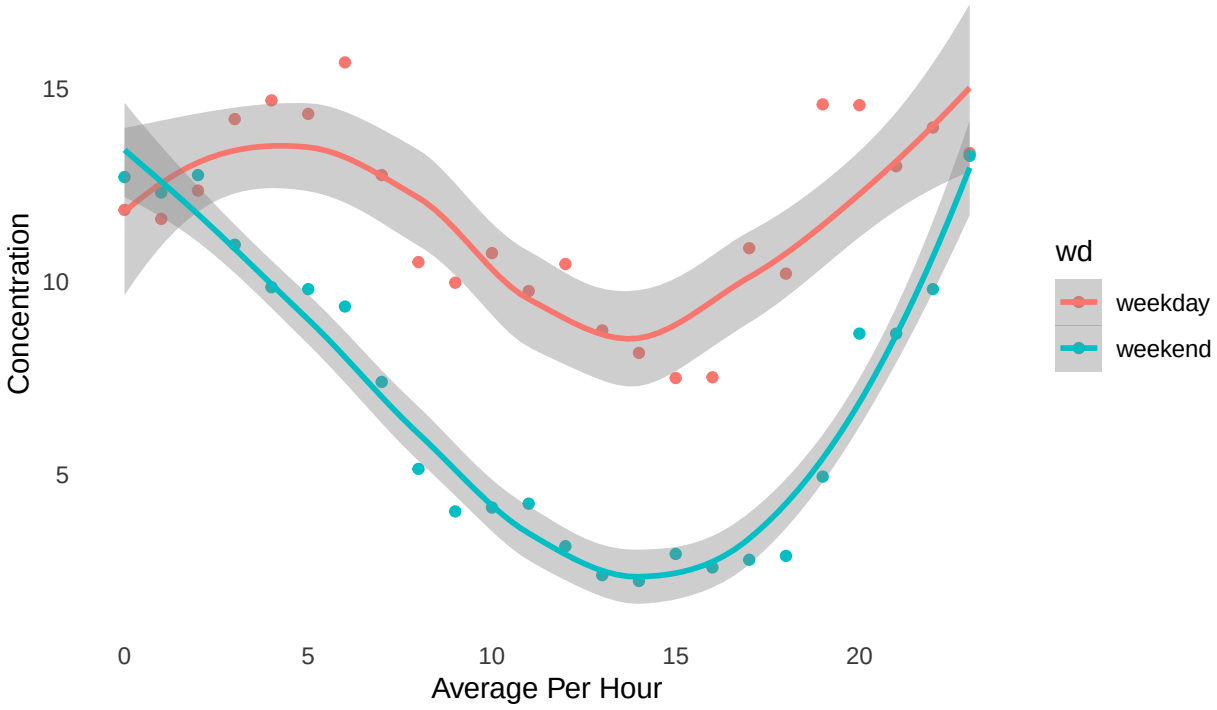


mean and 95% confidence interval in mean

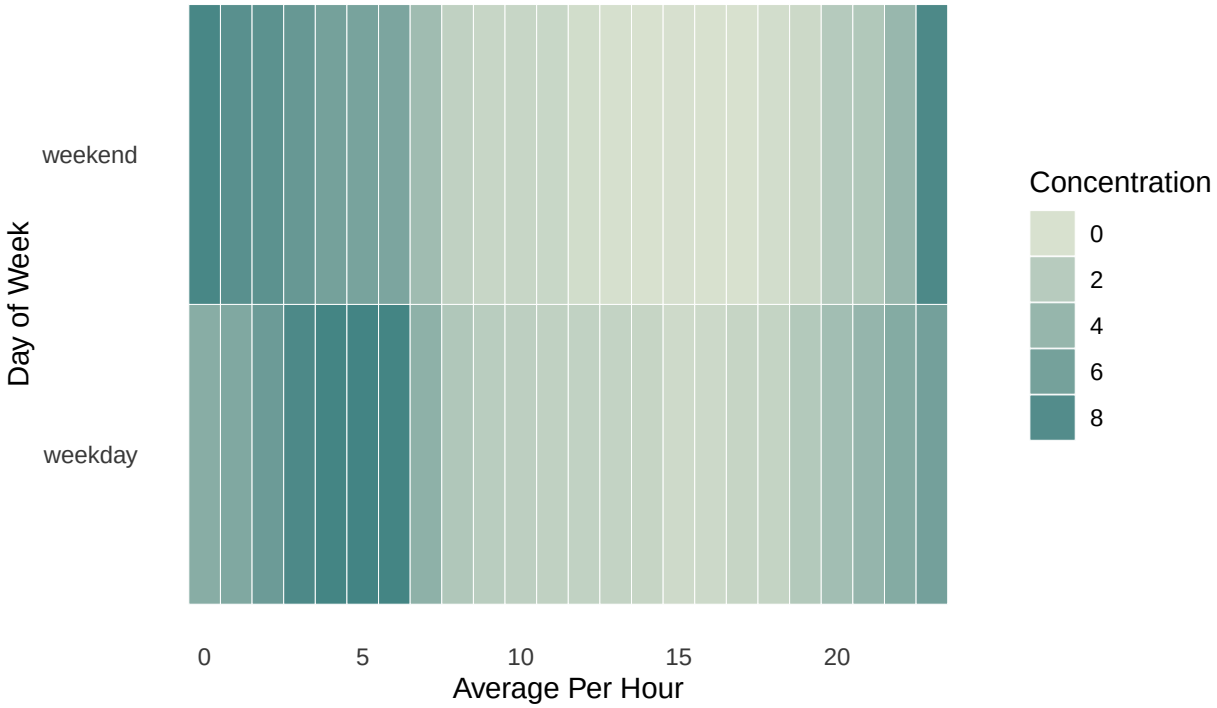
PM10 concentration by Weekday/weekend and Hour



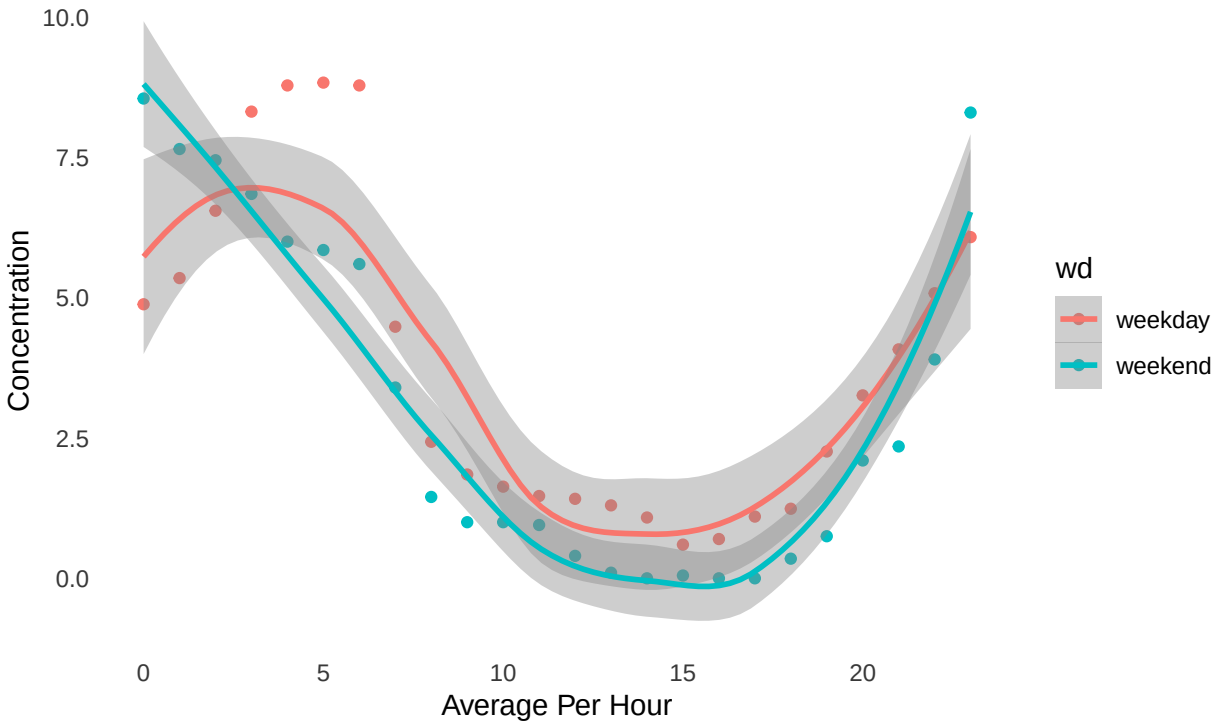
PM10 concentration by weekday and weekend with trend



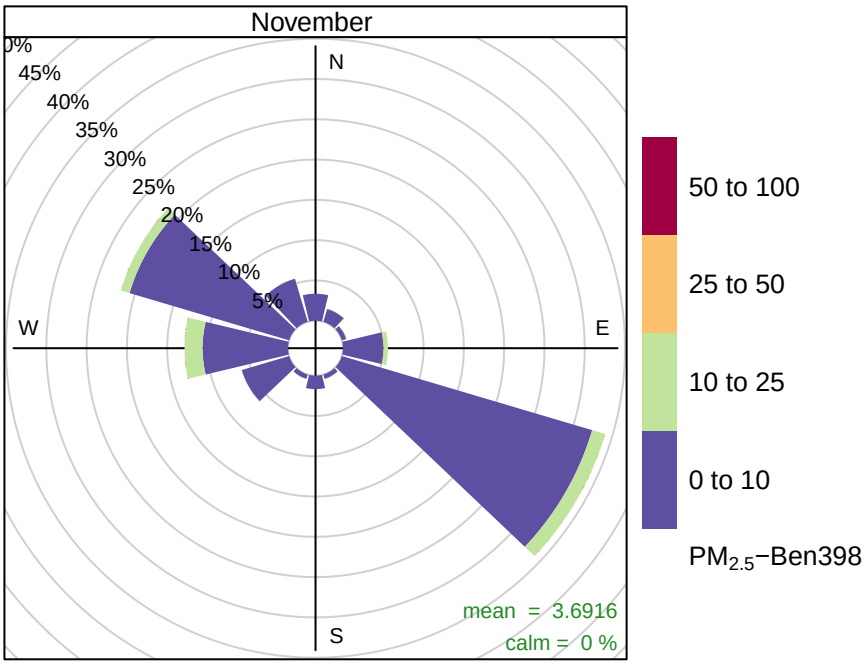
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

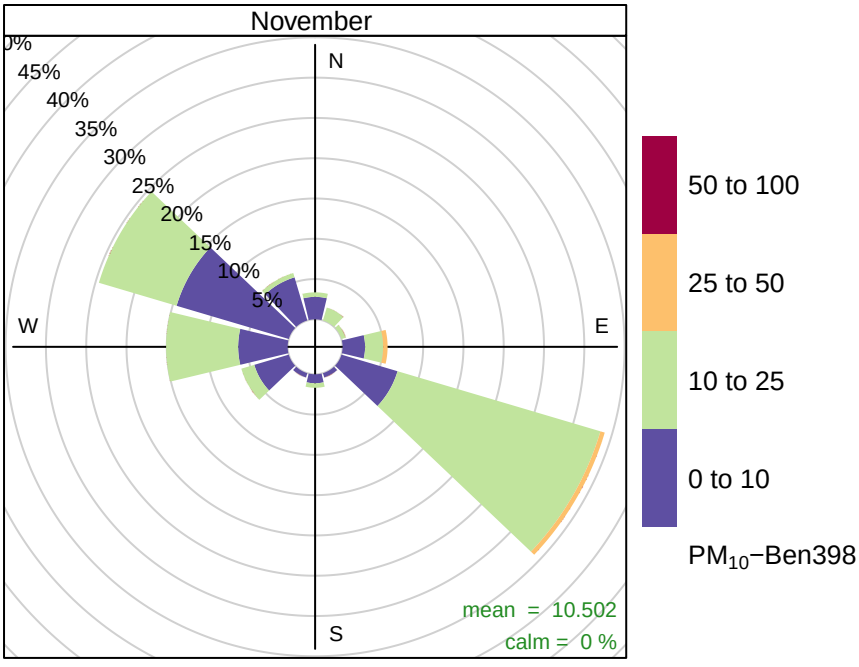


$PM_{2.5}$ pollution rose at Ben398



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben398



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

May-June 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
May 2022 - June 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-05-03	NA	NA	62.5	62.5
2022-05-04	4.2	61.0	95.8	95.8
2022-05-05	3.6	55.5	100.0	100.0
2022-05-06	4.4	44.0	100.0	100.0
2022-05-07	2.3	26.7	100.0	100.0
2022-05-08	2.3	24.0	100.0	100.0
2022-05-09	2.4	33.7	100.0	100.0
2022-05-10	5.7	86.6	100.0	100.0
2022-05-11	4.4	62.0	100.0	100.0
2022-05-12	2.4	25.5	100.0	100.0
2022-05-13	2.0	15.3	100.0	100.0
2022-05-14	1.9	13.4	100.0	100.0
2022-05-15	4.2	44.6	100.0	100.0
2022-05-16	5.1	85.8	100.0	100.0
2022-05-17	4.8	55.8	100.0	100.0
2022-05-18	5.1	83.1	100.0	100.0
2022-05-19	8.3	133.3	100.0	100.0
2022-05-20	1.9	24.0	100.0	100.0
2022-05-21	2.8	41.8	100.0	100.0
2022-05-22	2.6	33.8	100.0	100.0
2022-05-23	1.6	22.9	100.0	100.0
2022-05-24	2.4	27.3	100.0	100.0
2022-05-25	4.1	54.5	100.0	100.0
2022-05-26	6.5	104.0	100.0	100.0
2022-05-27	5.2	71.5	100.0	100.0
2022-05-28	1.4	14.3	100.0	100.0
2022-05-29	5.6	57.5	100.0	100.0
2022-05-30	5.8	88.2	100.0	100.0
2022-05-31	3.2	25.2	100.0	100.0
2022-06-01	1.1	4.7	100.0	100.0
2022-06-02	2.0	20.2	100.0	100.0
2022-06-03	3.5	56.8	100.0	100.0
2022-06-04	1.8	32.5	100.0	100.0
2022-06-05	4.3	68.2	100.0	100.0
2022-06-06	4.5	63.9	100.0	100.0
2022-06-07	10.1	178.2	100.0	100.0
2022-06-08	4.5	62.4	100.0	100.0
2022-06-09	3.9	30.5	100.0	100.0
2022-06-10	3.9	47.5	100.0	100.0
2022-06-11	2.7	21.2	100.0	100.0
2022-06-12	5.1	67.9	100.0	100.0
2022-06-13	8.6	127.7	100.0	100.0
2022-06-14	3.5	52.9	100.0	100.0
2022-06-15	4.8	87.1	100.0	100.0
2022-06-16	2.0	25.9	100.0	100.0

(continued)

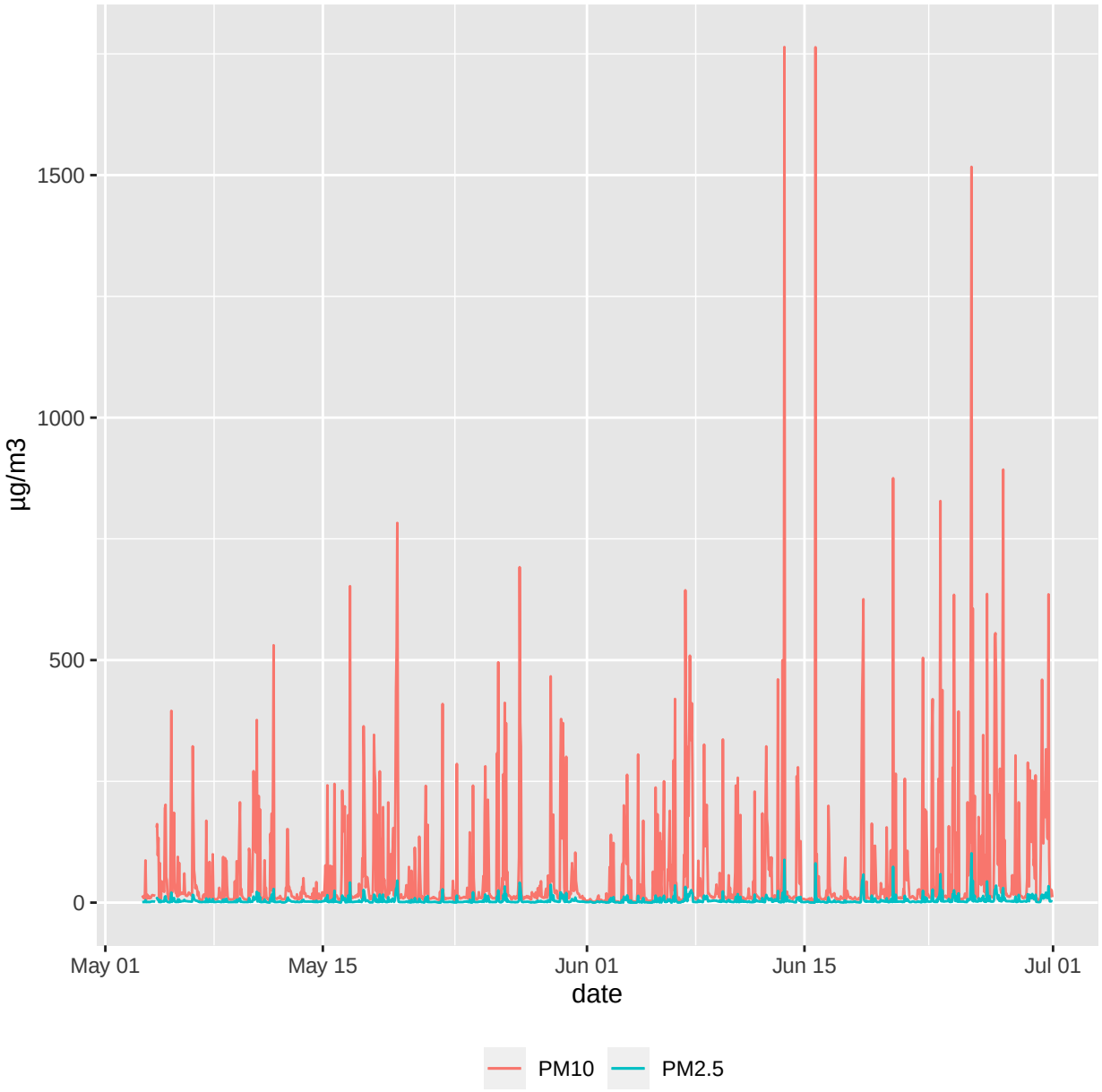
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-06-17	1.4	15.6	100.0	100.0
2022-06-18	8.6	82.4	100.0	100.0
2022-06-19	3.5	35.6	100.0	100.0
2022-06-20	6.4	76.2	100.0	100.0
2022-06-21	3.0	34.7	100.0	100.0
2022-06-22	3.8	62.4	100.0	100.0
2022-06-23	8.7	128.2	100.0	100.0
2022-06-24	6.7	99.0	100.0	100.0
2022-06-25	11.5	163.2	100.0	100.0
2022-06-26	7.0	97.0	100.0	100.0
2022-06-27	10.9	187.1	100.0	100.0
2022-06-28	3.6	41.9	100.0	100.0
2022-06-29	7.1	95.1	100.0	100.0
2022-06-30	8.8	145.9	100.0	100.0

Monthly Average

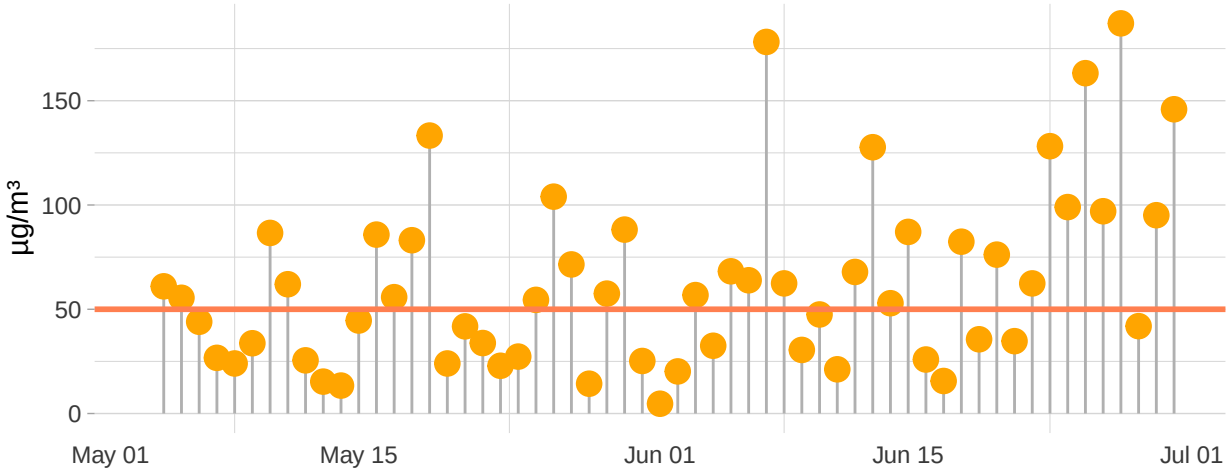
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
May 2022	3.792857	50.54643	98.56207	98.56207
June 2022	5.243333	73.73000	100.00000	100.00000

NA - Not enough data to calculate averages

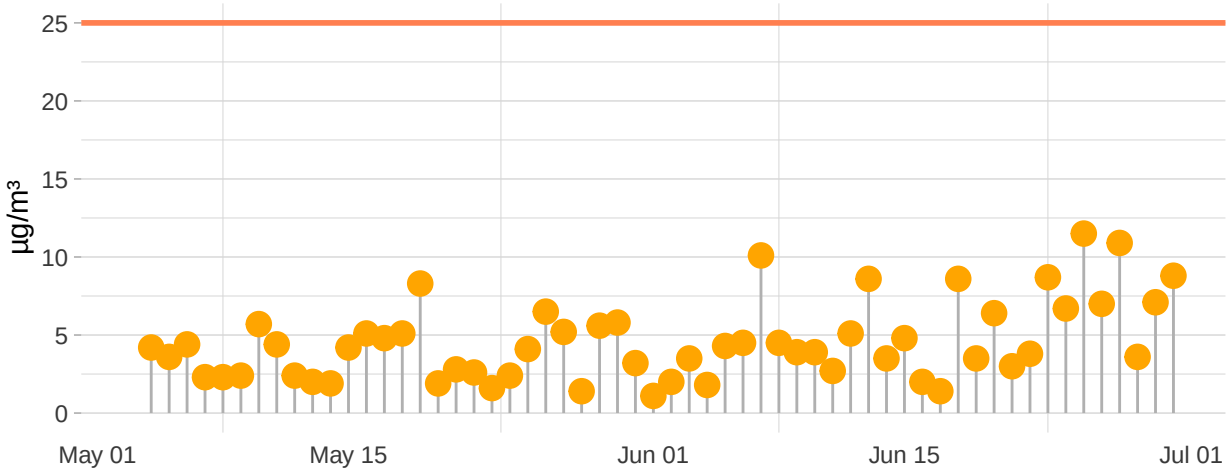
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

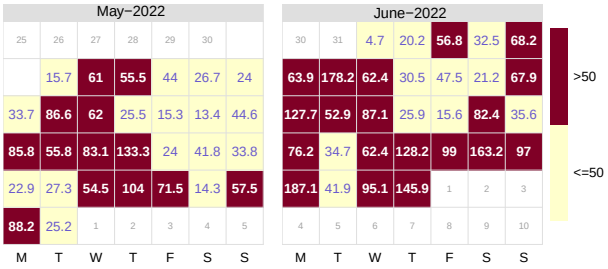


BENNETT RESOURCES

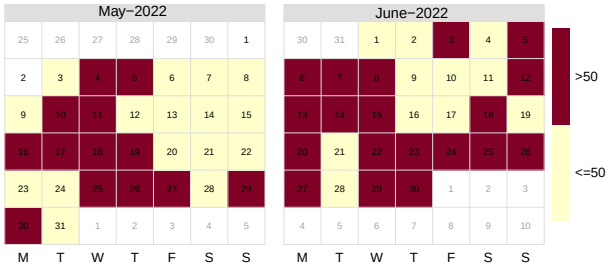
SITE: Ben399
Bi-Monthly Report
May 2022 - June 2022

Daily Exceedances

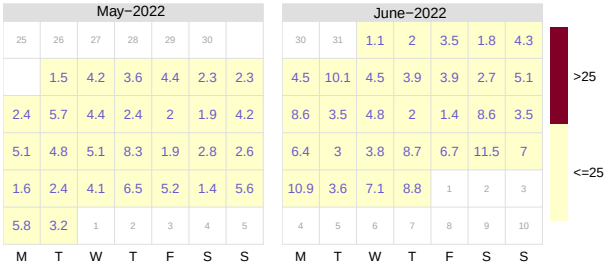
PM$_{10}$. Daily Exceedances at Ben399



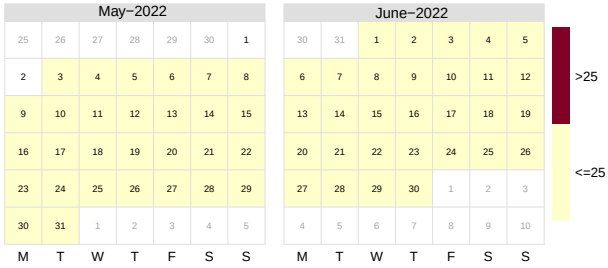
PM$_{10}$. Days with Exceedances at Ben399



PM$_{2.5}$. Daily Exceedances at Ben399



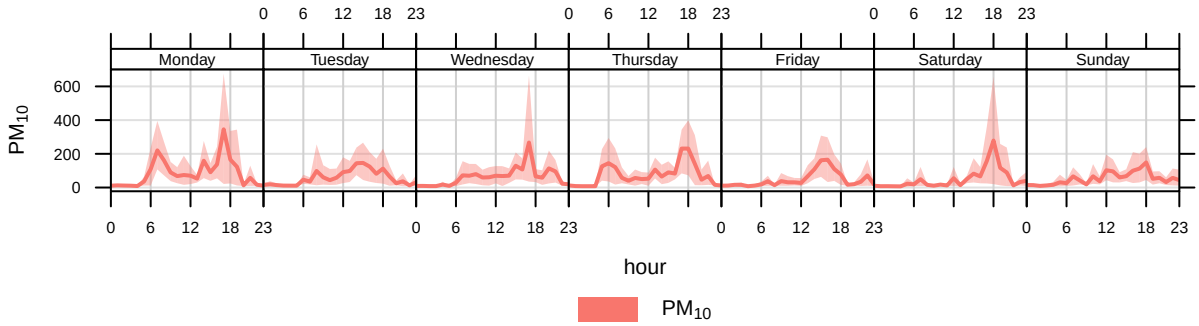
PM$_{2.5}$. Days with Exceedances at Ben399

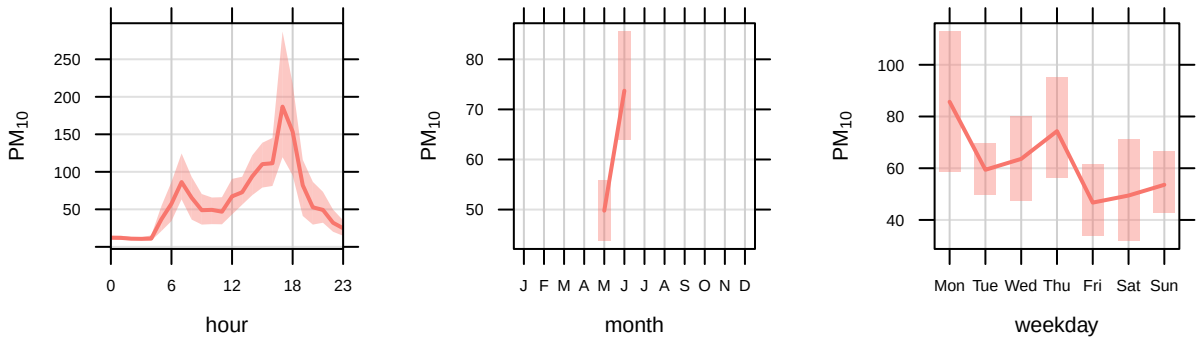


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
May 2022 - June 2022

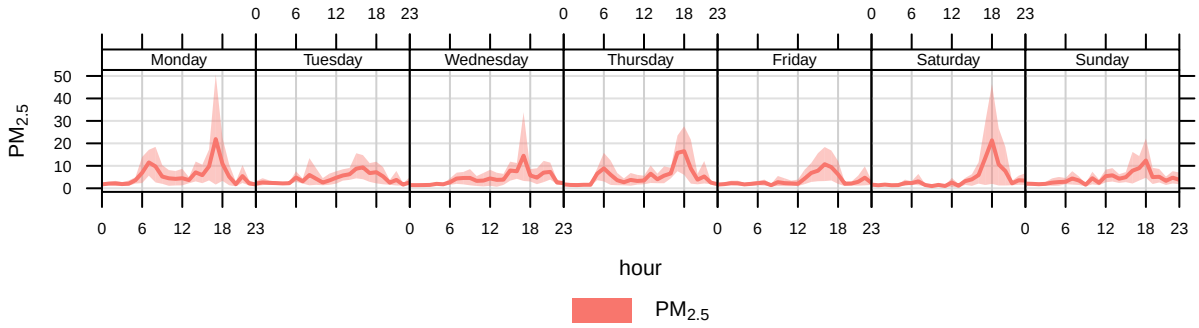
PM_{10} Time variation at Ben399

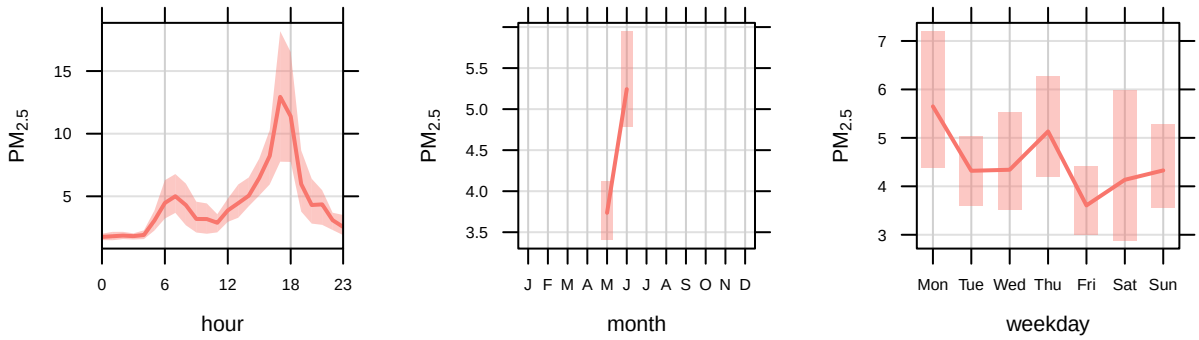




mean and 95% confidence interval in mean

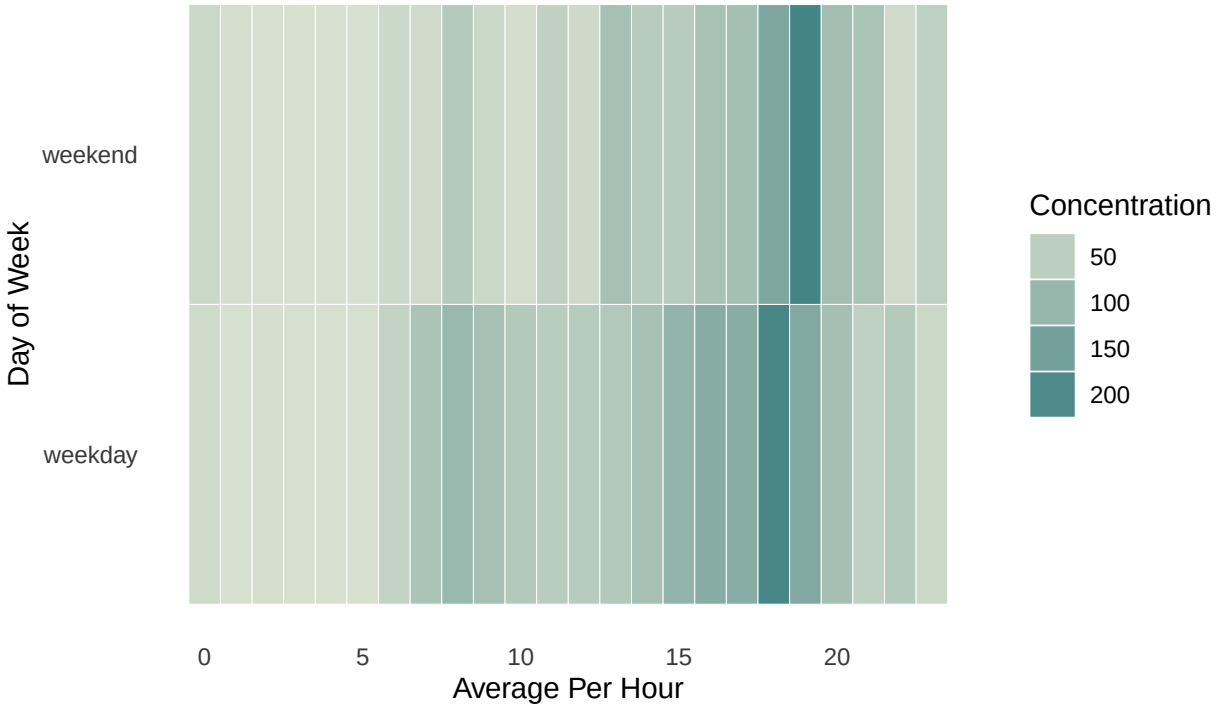
$PM_{2.5}$ Time variation at Ben399



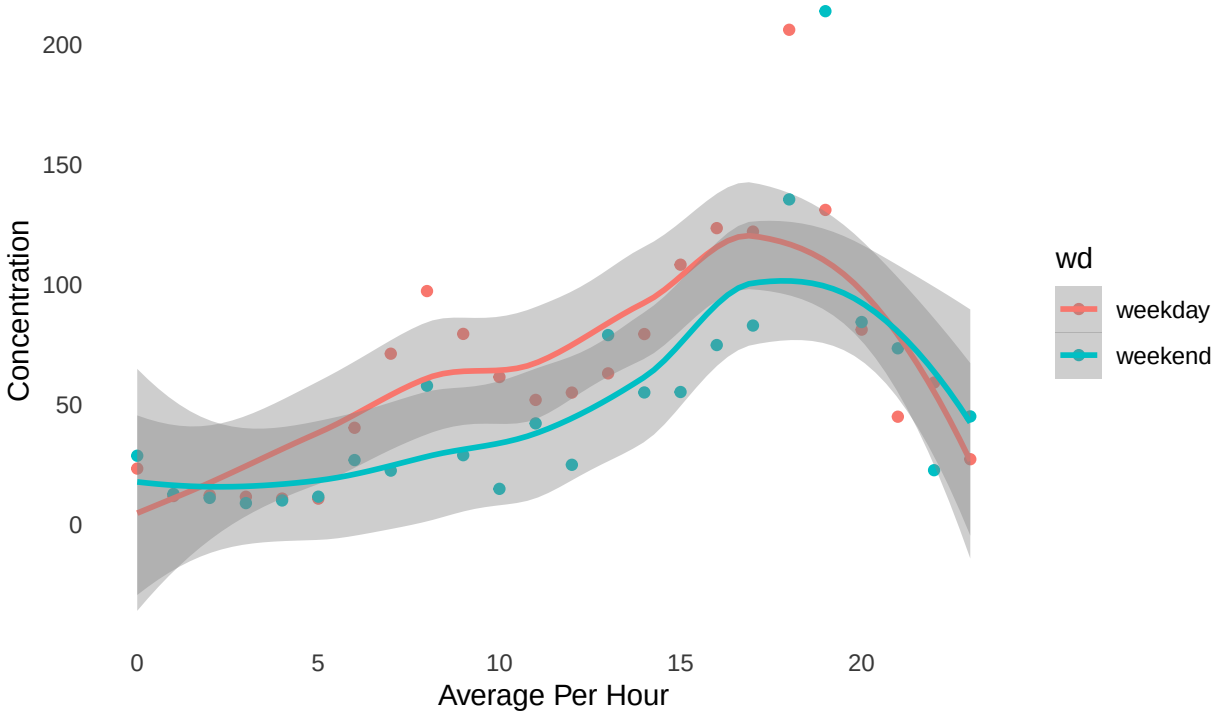


mean and 95% confidence interval in mean

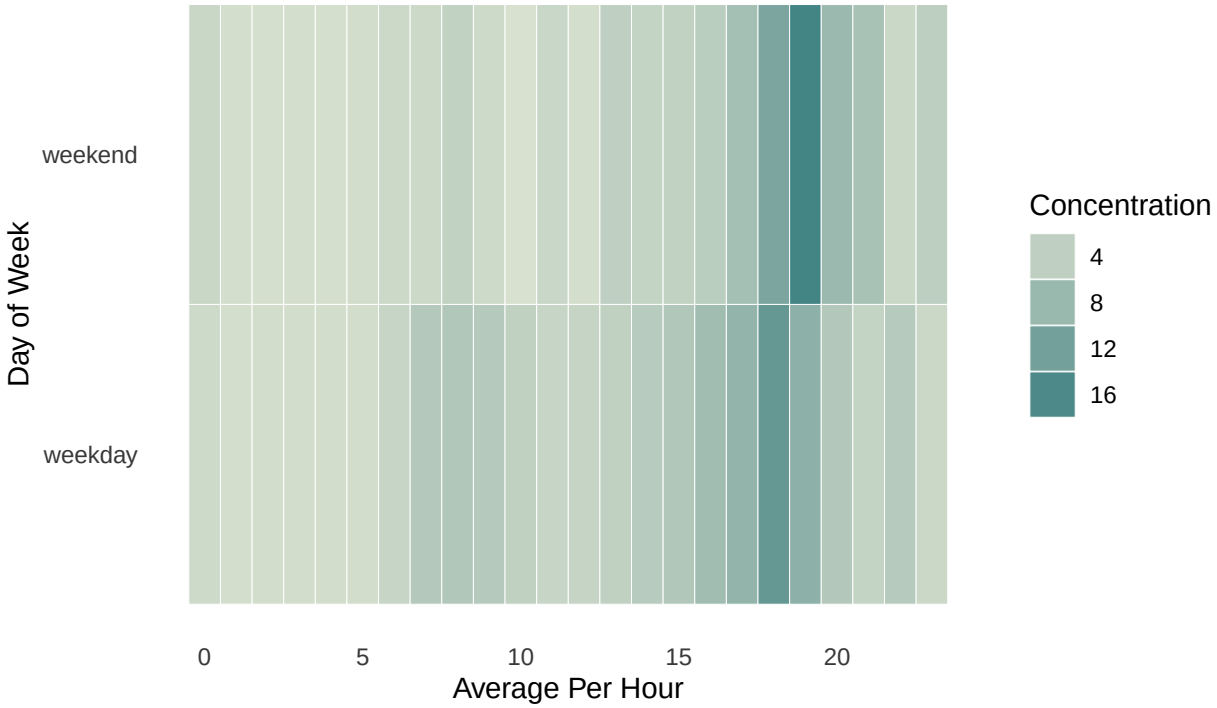
PM10 concentration by Weekday/weekend and Hour



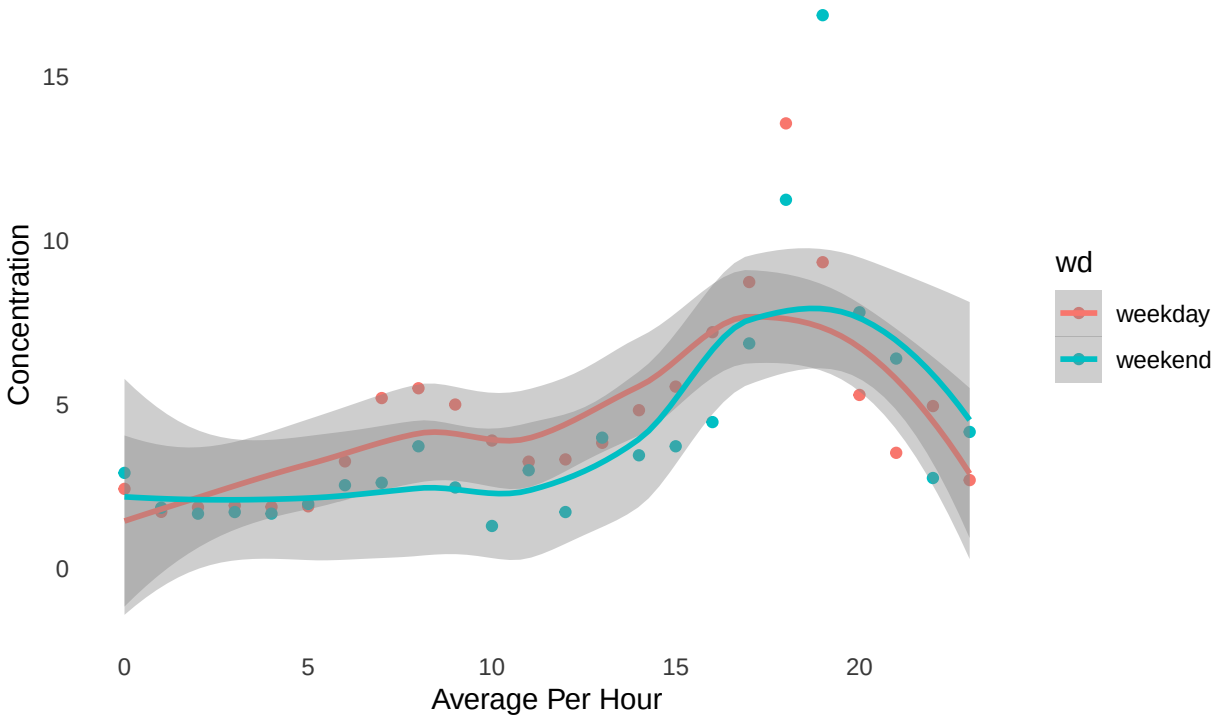
PM10 concentration by weekday and weekend with trend



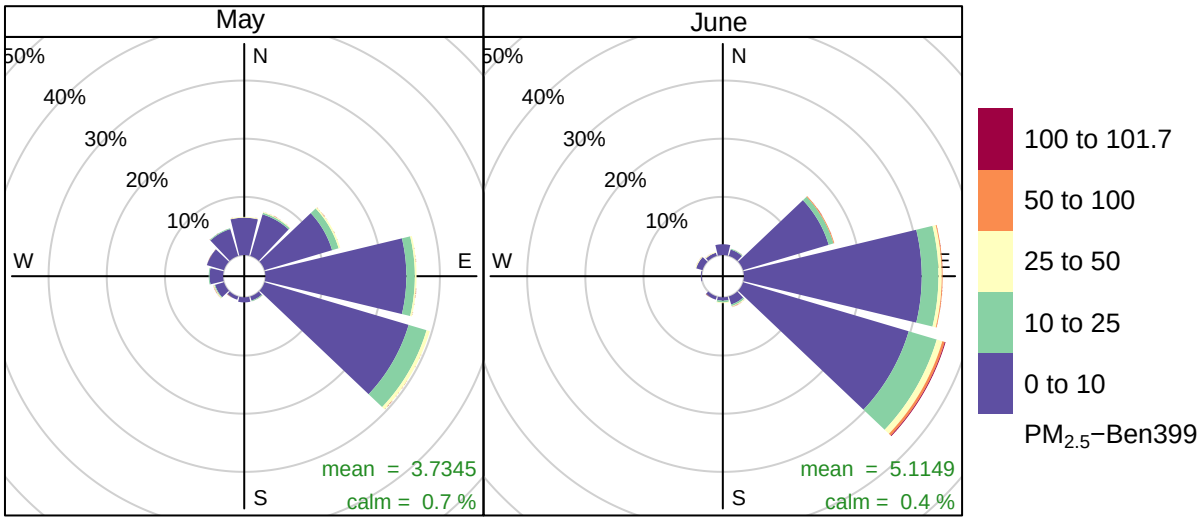
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

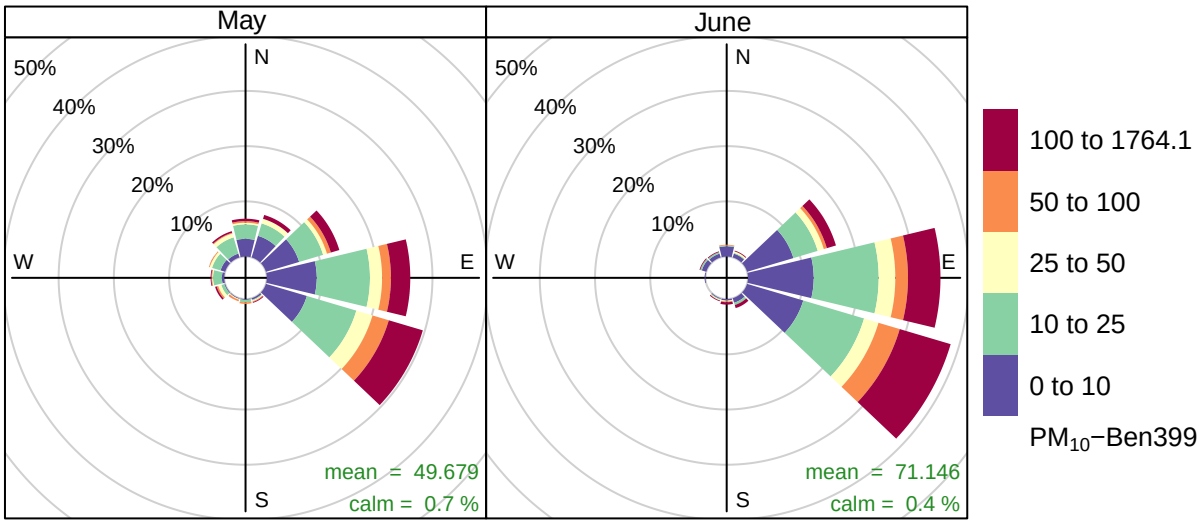


$PM_{2.5}$ pollution rose at Ben399



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

July-August 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
July 2022 - August 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-07-01	13.7	181.2	100.0	100.0
2022-07-02	6.2	74.1	100.0	100.0
2022-07-03	5.0	47.4	100.0	100.0
2022-07-04	6.6	78.5	100.0	100.0
2022-07-05	8.7	105.7	91.7	91.7
2022-07-06	4.2	40.2	100.0	100.0
2022-07-07	7.0	83.0	100.0	100.0
2022-07-08	11.4	164.5	100.0	100.0
2022-07-09	9.2	131.9	100.0	100.0
2022-07-10	13.5	158.6	100.0	100.0
2022-07-11	9.2	106.2	100.0	100.0
2022-07-12	8.2	91.7	100.0	100.0
2022-07-13	5.6	63.3	100.0	100.0
2022-07-14	3.0	22.1	100.0	100.0
2022-07-15	18.0	250.5	100.0	100.0
2022-07-16	3.4	24.1	100.0	100.0
2022-07-17	7.4	73.6	100.0	100.0
2022-07-18	7.5	55.7	100.0	100.0
2022-07-19	7.1	60.3	100.0	100.0
2022-07-20	8.5	80.9	100.0	100.0
2022-07-21	5.0	41.8	100.0	100.0
2022-07-22	14.1	149.0	100.0	100.0
2022-07-23	9.9	104.6	100.0	100.0
2022-07-24	13.8	154.0	100.0	100.0
2022-07-25	6.3	85.7	100.0	100.0
2022-07-26	4.6	67.4	100.0	100.0
2022-07-27	10.4	143.8	100.0	100.0
2022-07-28	7.5	90.6	100.0	100.0
2022-07-29	6.8	67.6	100.0	100.0
2022-07-30	22.5	239.1	100.0	100.0
2022-07-31	8.4	78.0	100.0	100.0
2022-08-01	3.2	24.7	100.0	100.0
2022-08-02	4.6	34.6	95.8	95.8
2022-08-03	4.6	33.9	100.0	100.0
2022-08-04	11.8	111.0	100.0	100.0
2022-08-05	15.0	198.4	100.0	100.0
2022-08-06	12.6	147.8	100.0	100.0
2022-08-07	7.2	75.8	100.0	100.0
2022-08-08	14.0	152.8	100.0	100.0
2022-08-09	9.1	90.9	100.0	100.0
2022-08-10	16.4	232.3	100.0	100.0
2022-08-11	11.1	134.0	100.0	100.0
2022-08-12	6.8	97.0	100.0	100.0
2022-08-13	7.3	90.0	100.0	100.0
2022-08-14	2.7	29.8	100.0	100.0

(continued)

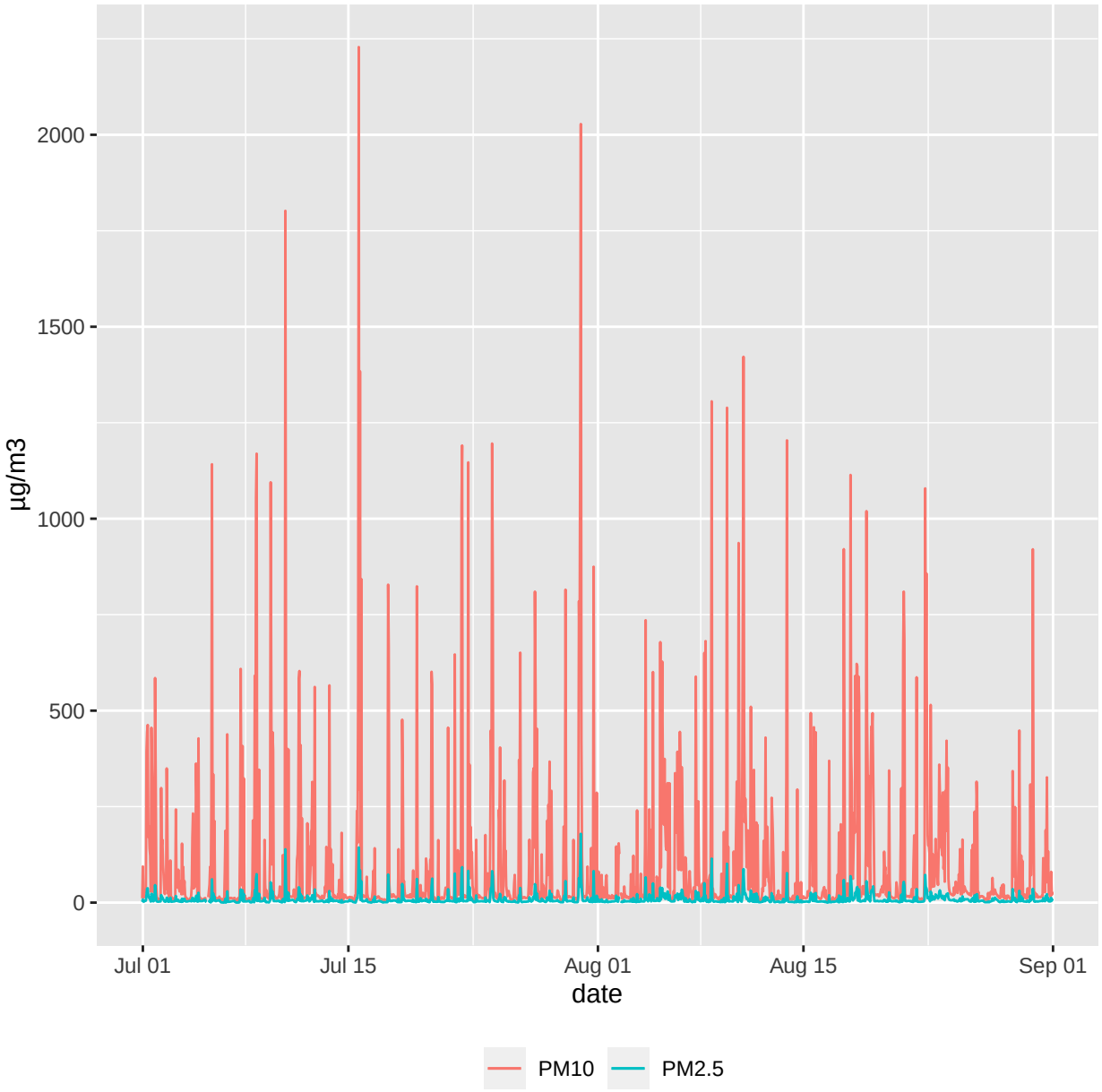
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-08-15	7.3	103.5	100.0	100.0
2022-08-16	2.6	29.8	100.0	100.0
2022-08-17	7.8	94.8	100.0	100.0
2022-08-18	18.6	251.1	100.0	100.0
2022-08-19	16.1	210.3	100.0	100.0
2022-08-20	5.4	50.8	100.0	100.0
2022-08-21	9.8	122.1	100.0	100.0
2022-08-22	5.5	58.3	100.0	100.0
2022-08-23	15.5	199.0	100.0	100.0
2022-08-24	16.2	171.3	100.0	100.0
2022-08-25	6.0	41.5	100.0	100.0
2022-08-26	7.8	69.2	100.0	100.0
2022-08-27	3.5	18.2	100.0	100.0
2022-08-28	4.6	21.6	100.0	100.0
2022-08-29	8.2	88.9	100.0	100.0
2022-08-30	6.6	93.0	100.0	100.0
2022-08-31	6.8	56.7	100.0	100.0

Monthly Average

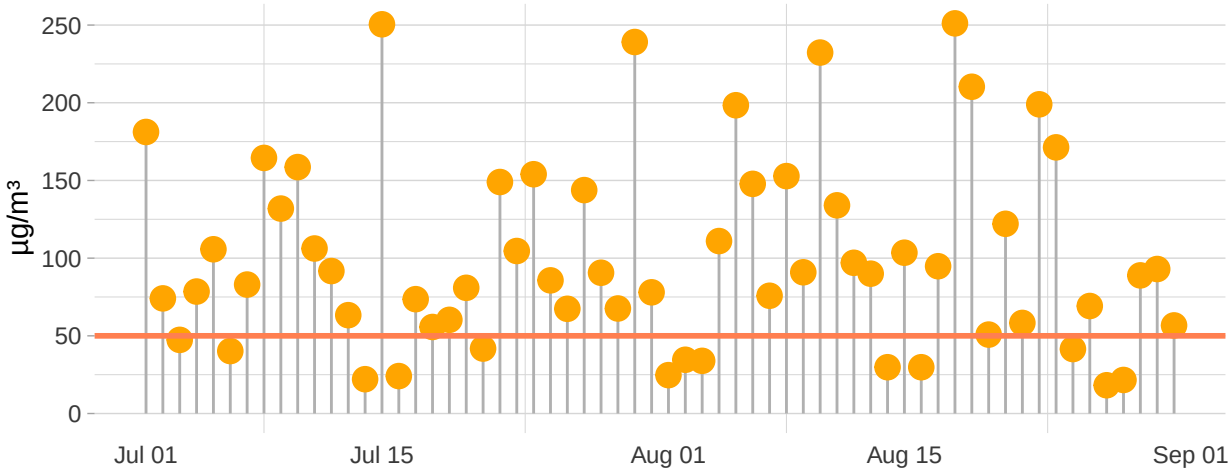
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
July 2022	8.796774	100.4871	99.73226	99.73226
August 2022	8.861290	101.0677	99.86452	99.86452

NA - Not enough data to calculate averages

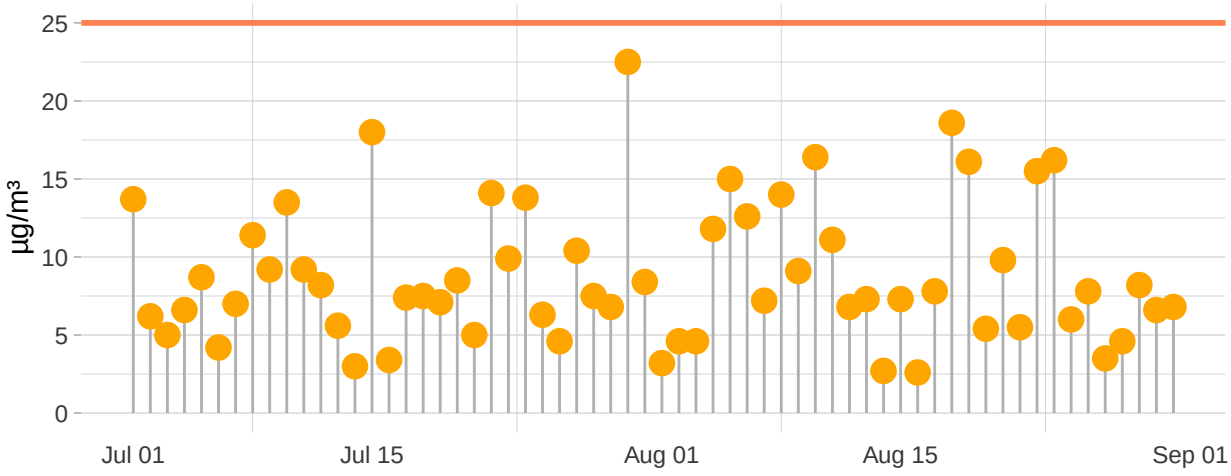
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

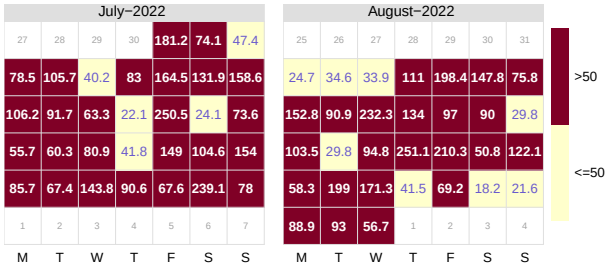


BENNETT RESOURCES

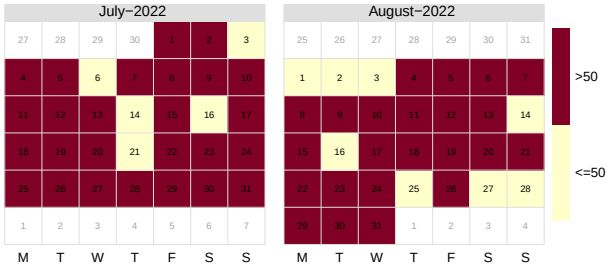
SITE: Ben399
Bi-Monthly Report
July 2022 - August 2022

Daily Exceedances

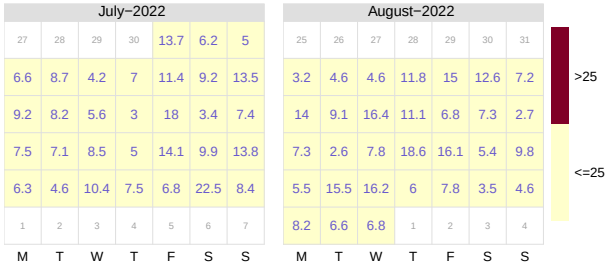
PM$_{10}$. Daily Exceedances at Ben399



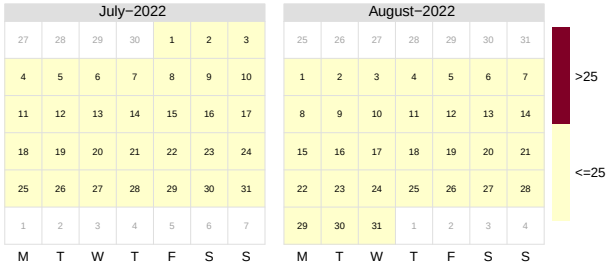
PM$_{10}$. Days with Exceedances at Ben399



PM$_{2.5}$. Daily Exceedances at Ben399



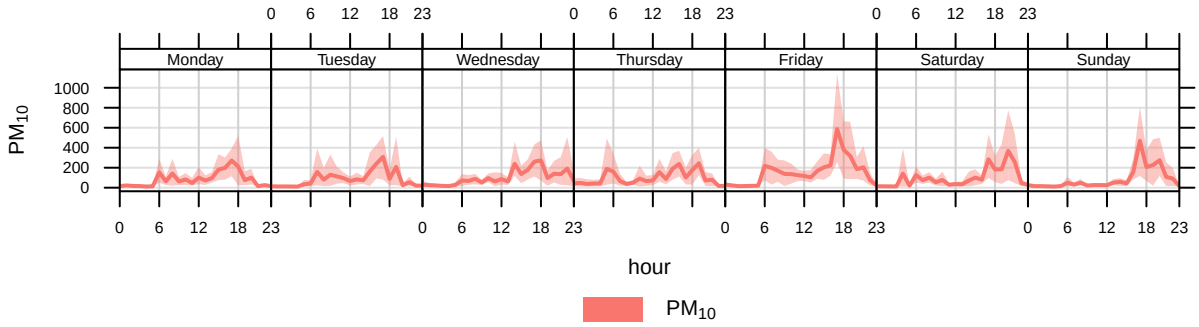
PM$_{2.5}$. Days with Exceedances at Ben399

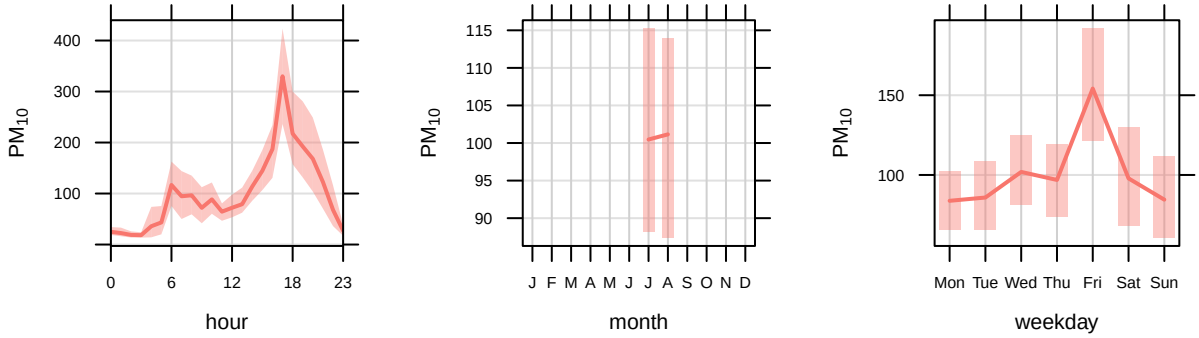


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
July 2022 - August 2022

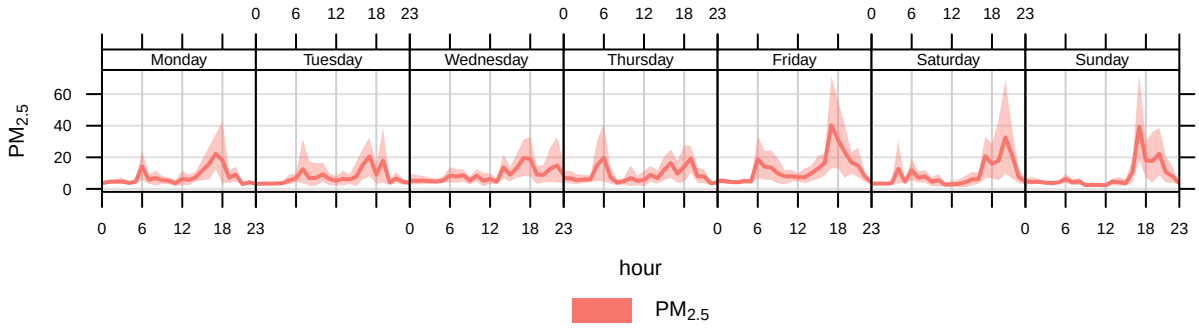
PM_{10} Time variation at Ben399

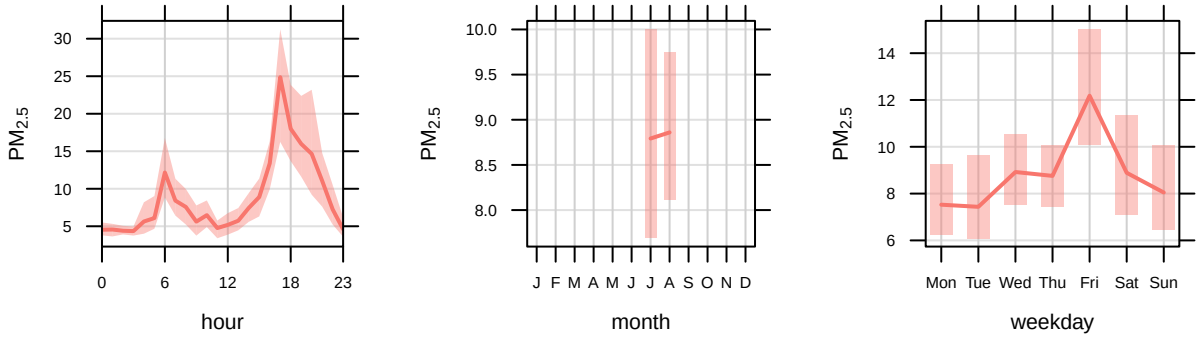




mean and 95% confidence interval in mean

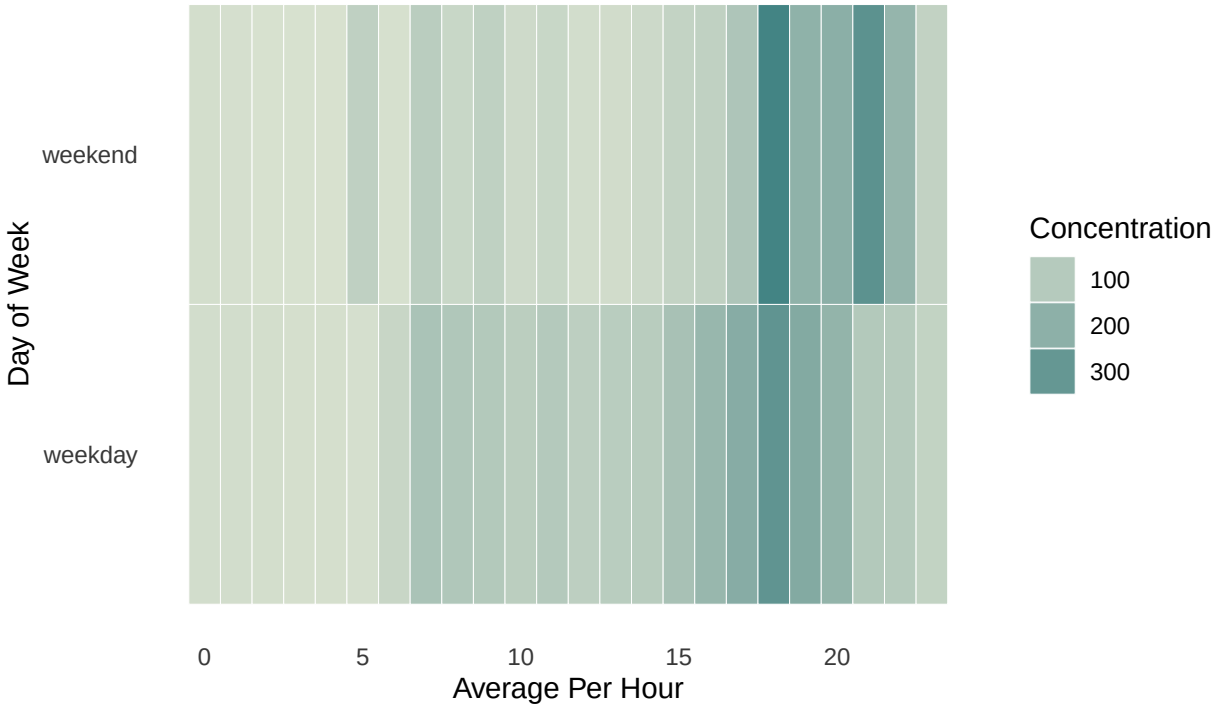
$PM_{2.5}$ Time variation at Ben399



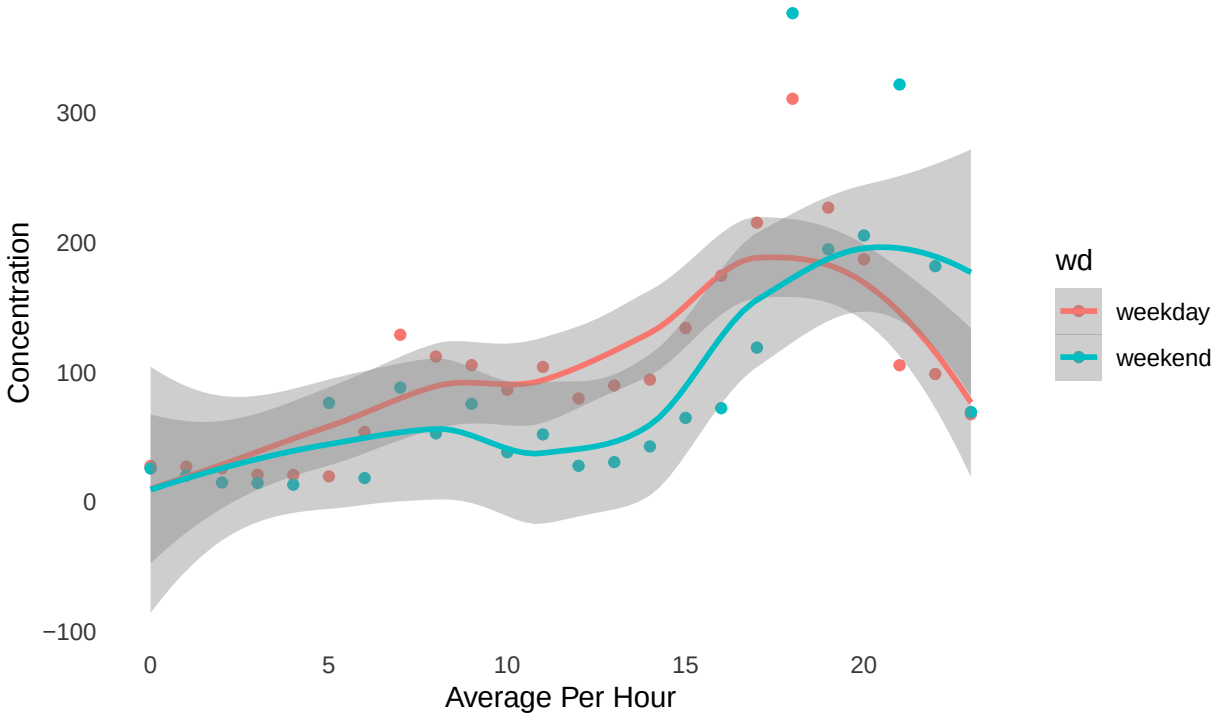


mean and 95% confidence interval in mean

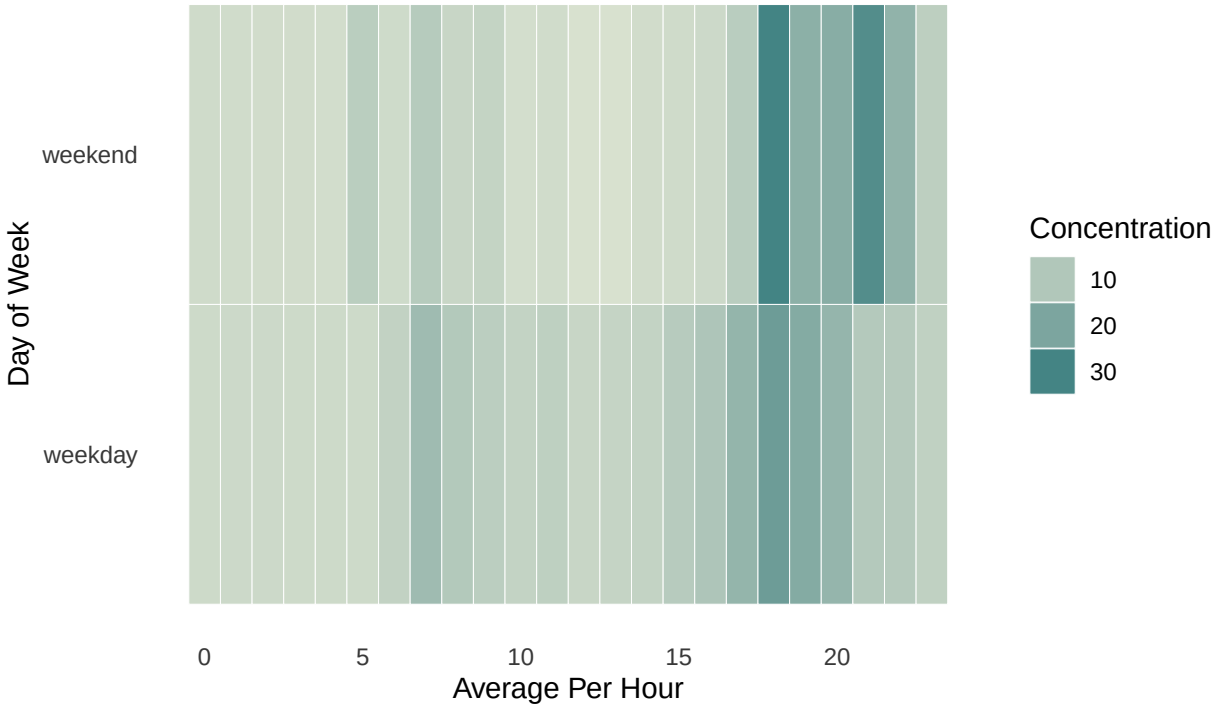
PM10 concentration by Weekday/weekend and Hour



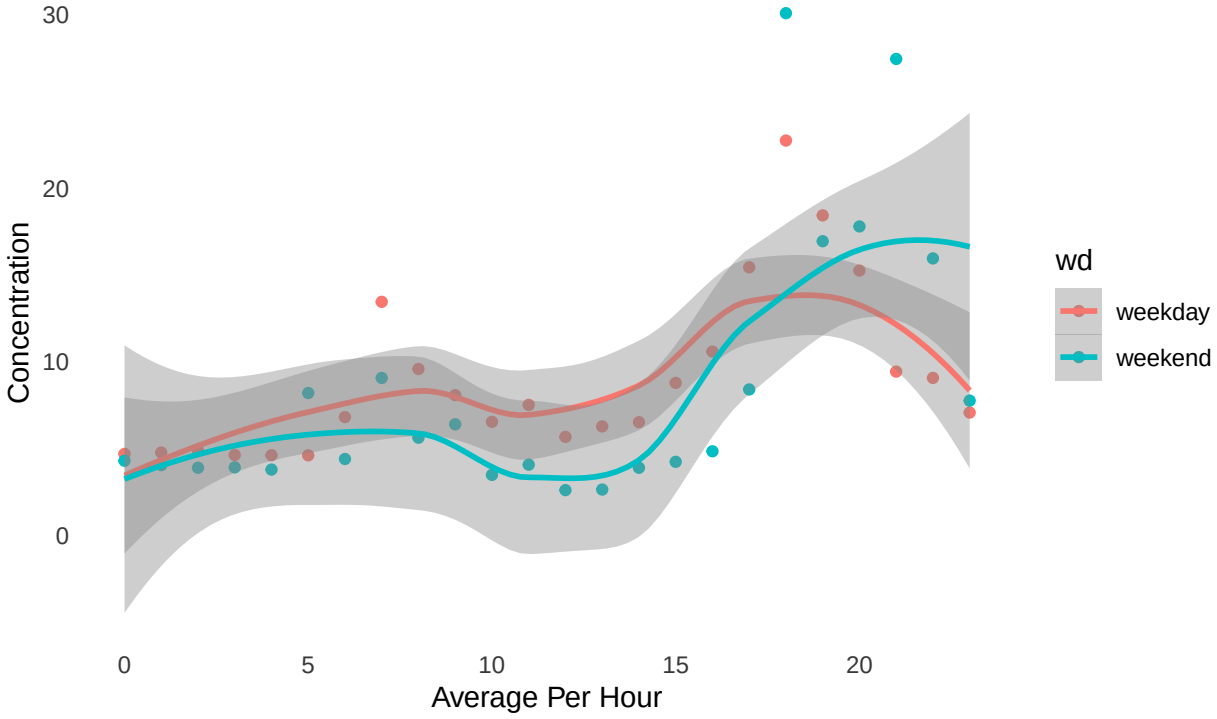
PM10 concentration by weekday and weekend with trend



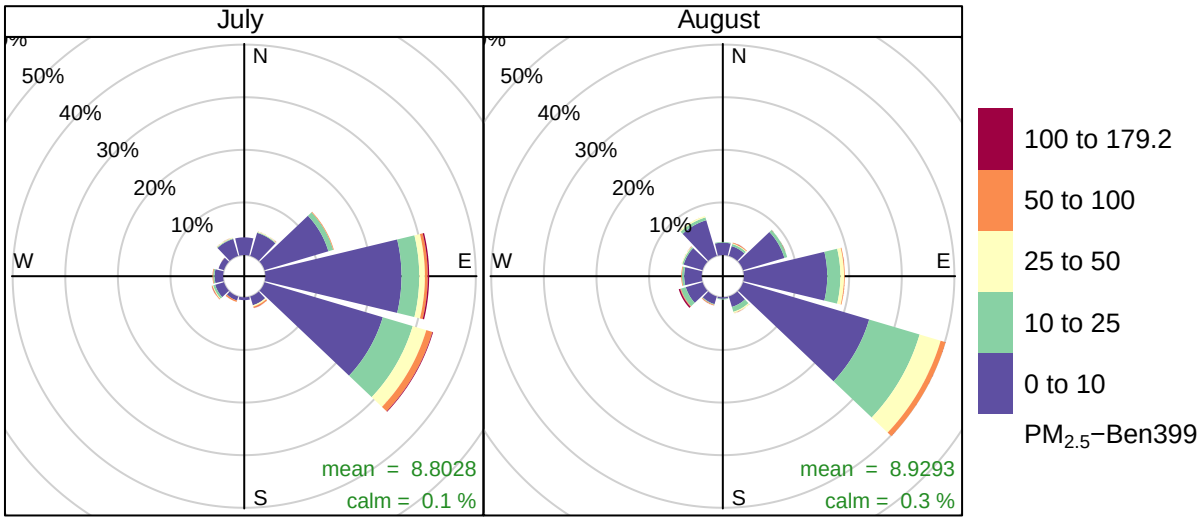
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

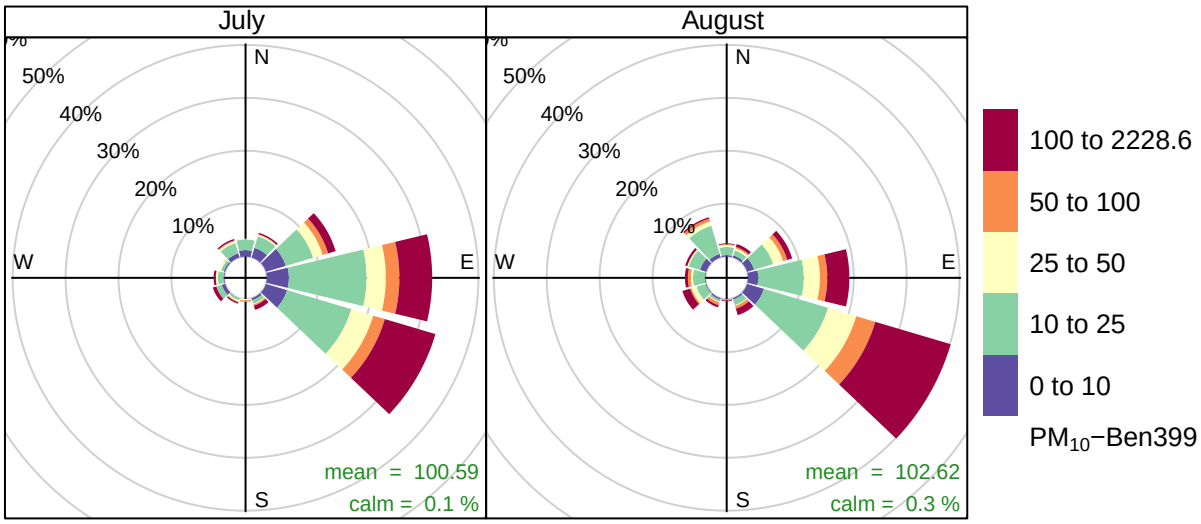


$PM_{2.5}$ pollution rose at Ben399



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

September-October 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
September 2022 - October 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-09-01	11.5	124.8	100.0	100.0
2022-09-02	5.2	61.8	100.0	100.0
2022-09-03	1.8	13.7	100.0	100.0
2022-09-04	5.9	43.6	100.0	100.0
2022-09-05	5.0	38.8	100.0	100.0
2022-09-06	5.7	37.4	95.8	95.8
2022-09-07	9.3	67.8	100.0	100.0
2022-09-08	6.2	75.1	100.0	100.0
2022-09-09	3.9	25.5	100.0	100.0
2022-09-10	9.0	62.4	100.0	100.0
2022-09-11	7.0	64.4	100.0	100.0
2022-09-12	5.6	39.8	100.0	100.0
2022-09-13	12.5	126.2	100.0	100.0
2022-09-14	14.6	160.4	100.0	100.0
2022-09-15	11.3	117.4	100.0	100.0
2022-09-16	6.0	57.4	100.0	100.0
2022-09-17	8.9	89.0	100.0	100.0
2022-09-18	13.1	135.3	100.0	100.0
2022-09-19	3.2	20.8	100.0	100.0
2022-09-20	8.9	70.2	100.0	100.0
2022-09-21	7.5	73.1	100.0	100.0
2022-09-22	7.2	80.9	100.0	100.0
2022-09-23	6.8	69.3	100.0	100.0
2022-09-24	5.7	39.9	100.0	100.0
2022-09-25	4.1	19.6	100.0	100.0
2022-09-26	5.3	39.9	100.0	100.0
2022-09-27	3.0	20.1	100.0	100.0
2022-09-28	6.1	50.2	100.0	100.0
2022-09-29	3.4	15.4	100.0	100.0
2022-09-30	2.3	6.0	100.0	100.0
2022-10-01	0.6	2.7	91.7	91.7
2022-10-02	NA	NA	NA	NA
2022-10-03	2.3	6.3	100.0	100.0
2022-10-04	2.0	5.0	100.0	100.0
2022-10-05	1.8	5.6	100.0	100.0
2022-10-06	2.1	10.5	100.0	100.0
2022-10-07	2.3	16.1	100.0	100.0
2022-10-08	1.8	13.1	100.0	100.0
2022-10-09	3.0	25.2	100.0	100.0
2022-10-10	2.6	18.5	100.0	100.0
2022-10-11	1.4	7.1	100.0	100.0
2022-10-12	4.9	13.4	100.0	100.0
2022-10-13	7.0	51.9	100.0	100.0
2022-10-14	4.2	34.2	100.0	100.0
2022-10-15	3.0	20.6	100.0	100.0

(continued)

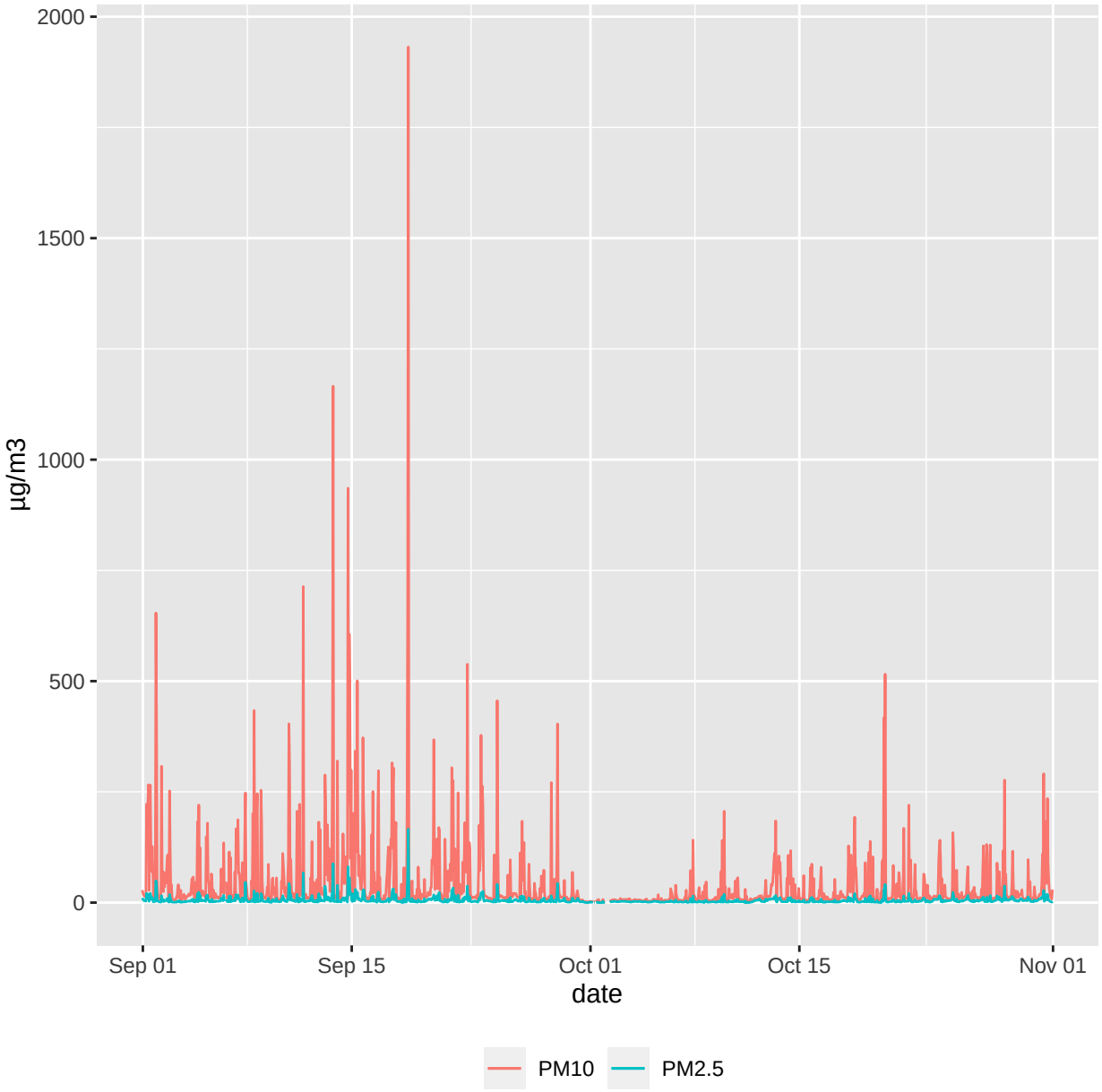
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-10-16	2.1	15.9	100.0	100.0
2022-10-17	2.3	12.7	100.0	100.0
2022-10-18	5.6	48.1	100.0	100.0
2022-10-19	3.7	32.6	100.0	100.0
2022-10-20	5.4	64.0	100.0	100.0
2022-10-21	3.0	24.5	100.0	100.0
2022-10-22	4.5	37.4	100.0	100.0
2022-10-23	3.9	17.8	100.0	100.0
2022-10-24	6.4	33.3	100.0	100.0
2022-10-25	5.6	27.3	100.0	100.0
2022-10-26	5.6	19.8	100.0	100.0
2022-10-27	5.7	37.4	100.0	100.0
2022-10-28	8.2	40.8	100.0	100.0
2022-10-29	6.7	22.1	100.0	100.0
2022-10-30	4.7	17.8	100.0	100.0
2022-10-31	9.0	67.1	100.0	100.0

Monthly Average

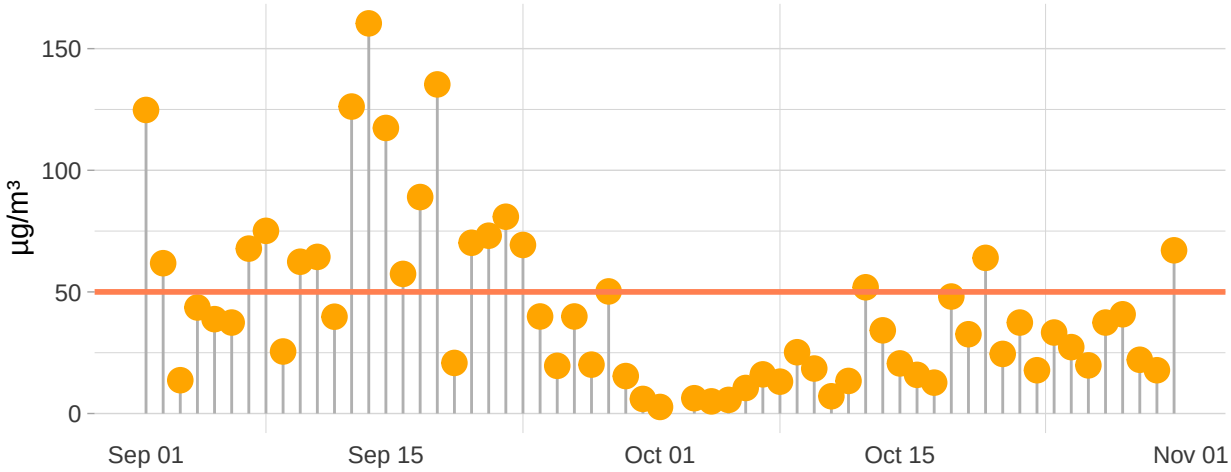
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
September 2022	6.866667	61.54	99.86000	99.86000
October 2022	4.046667	24.96	99.72333	99.72333

NA - Not enough data to calculate averages

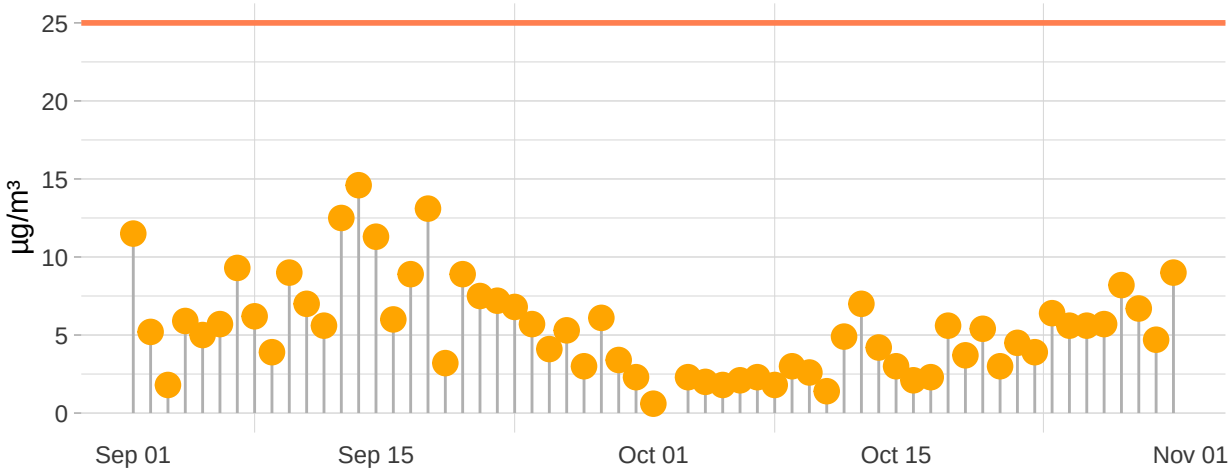
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

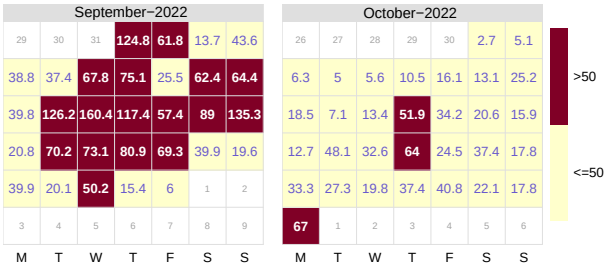


BENNETT RESOURCES

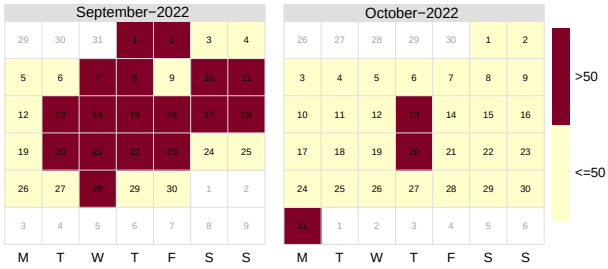
SITE: Ben399
Bi-Monthly Report
September 2022 - October 2022

Daily Exceedances

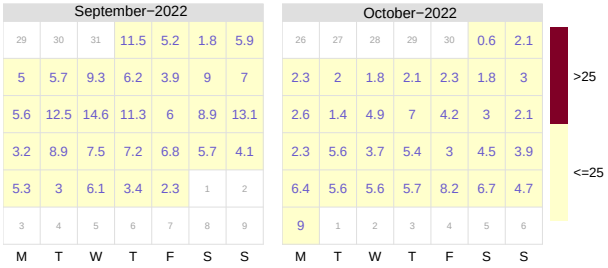
PM$_{10}$. Daily Exceedances at Ben399



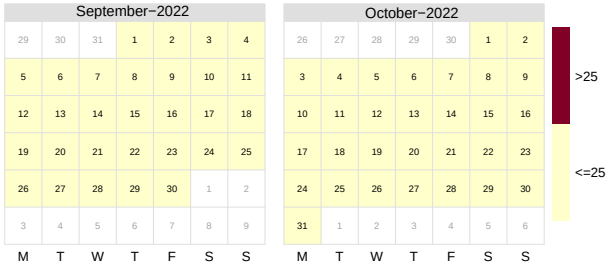
PM$_{10}$. Days with Exceedances at Ben399



PM$_{2.5}$. Daily Exceedances at Ben399



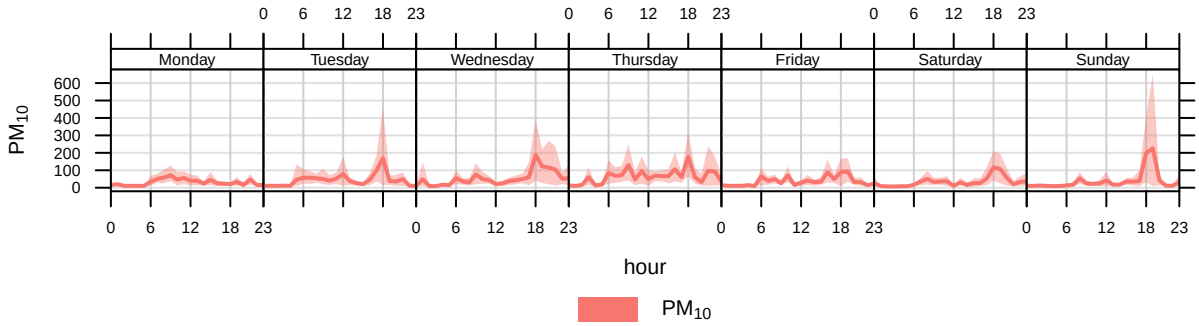
PM$_{2.5}$. Days with Exceedances at Ben399

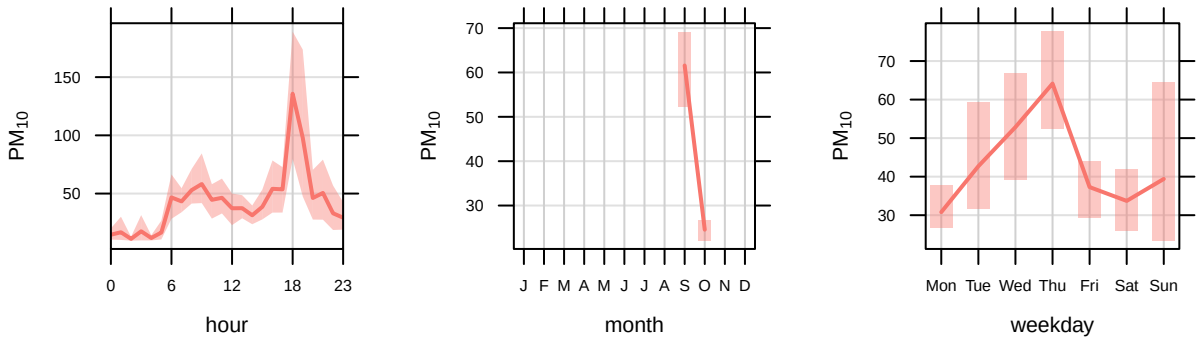


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
September 2022 - October 2022

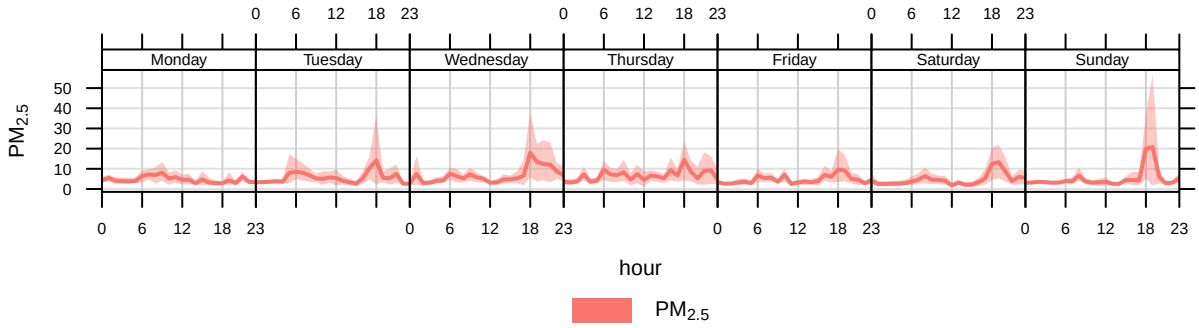
PM_{10} Time variation at Ben399

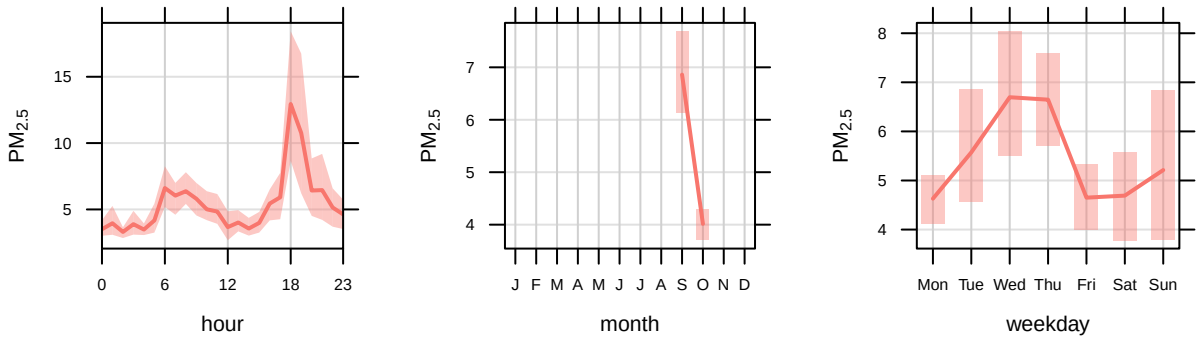




mean and 95% confidence interval in mean

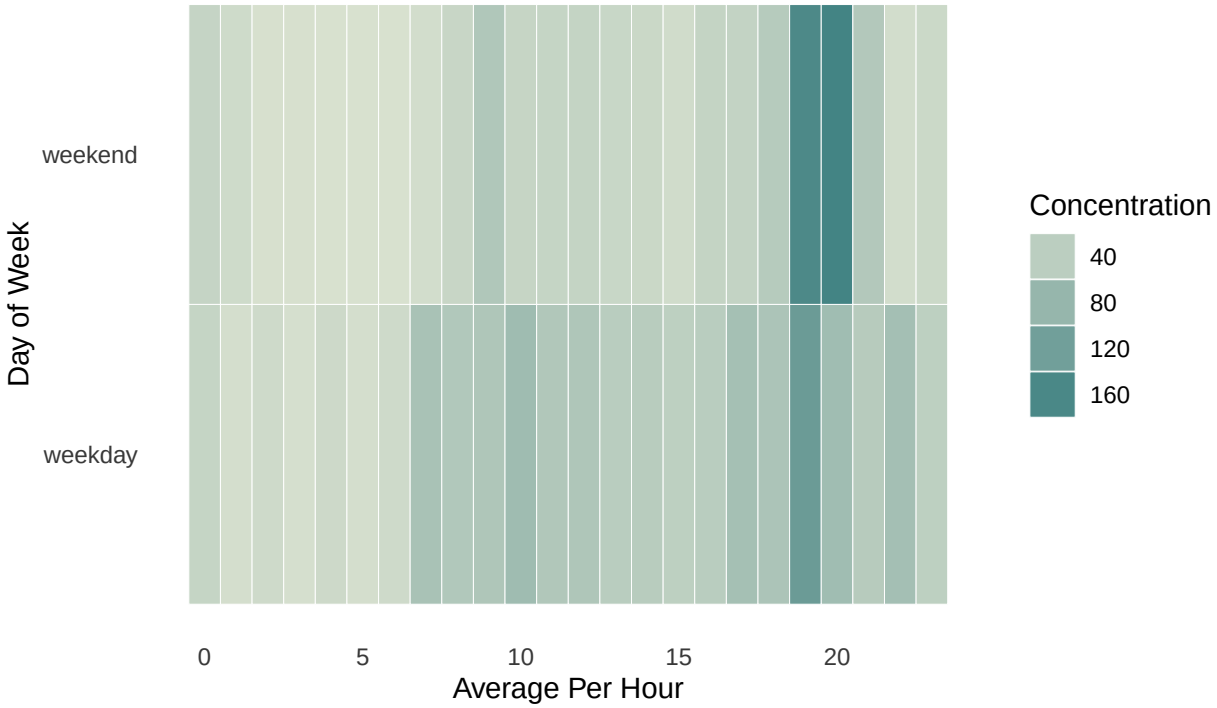
$PM_{2.5}$ Time variation at Ben399



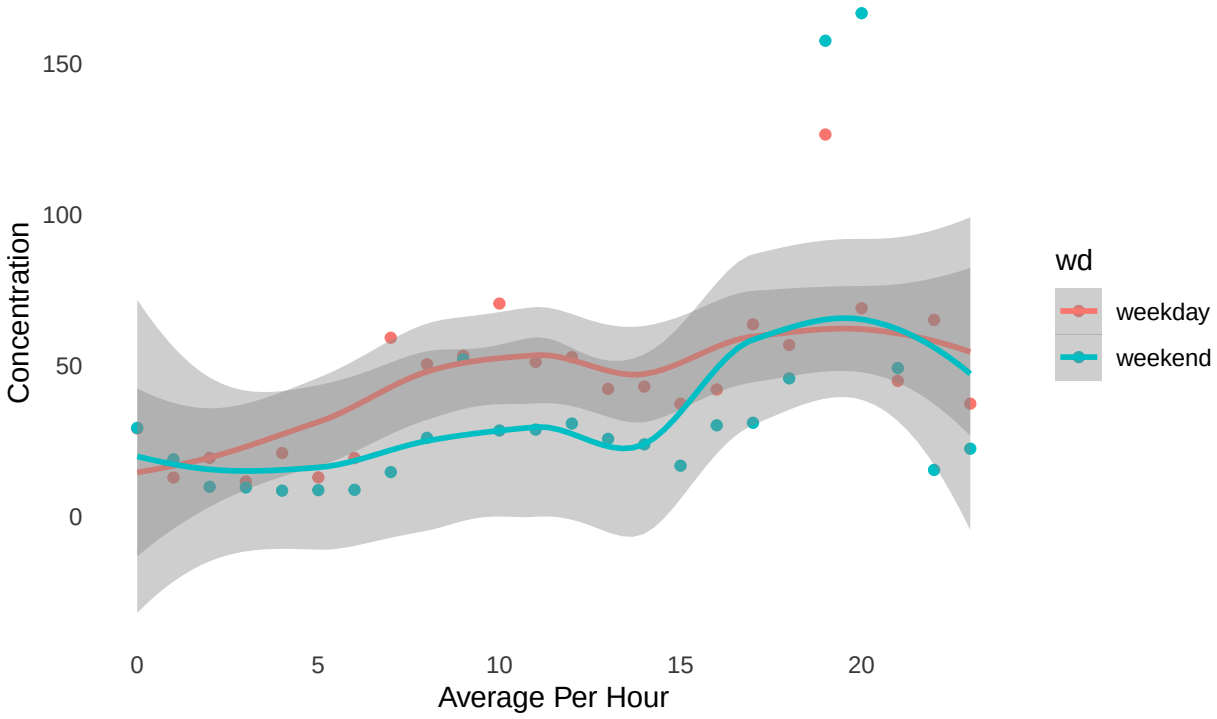


mean and 95% confidence interval in mean

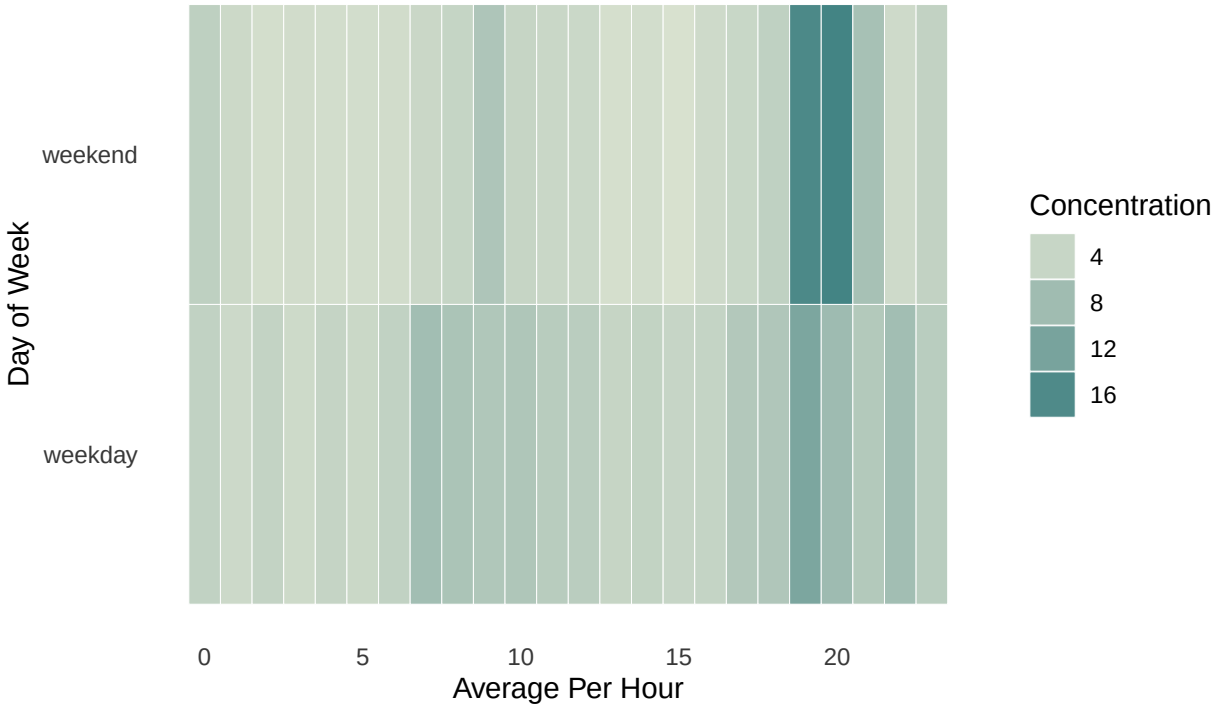
PM10 concentration by Weekday/weekend and Hour



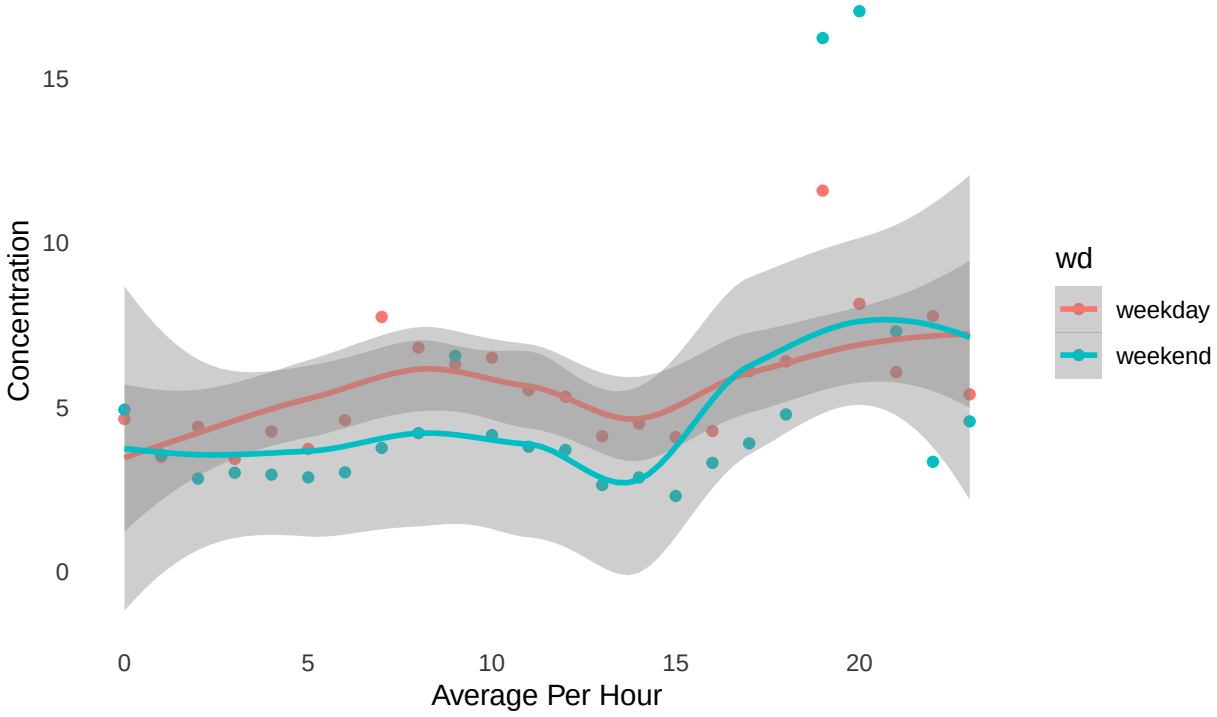
PM10 concentration by weekday and weekend with trend



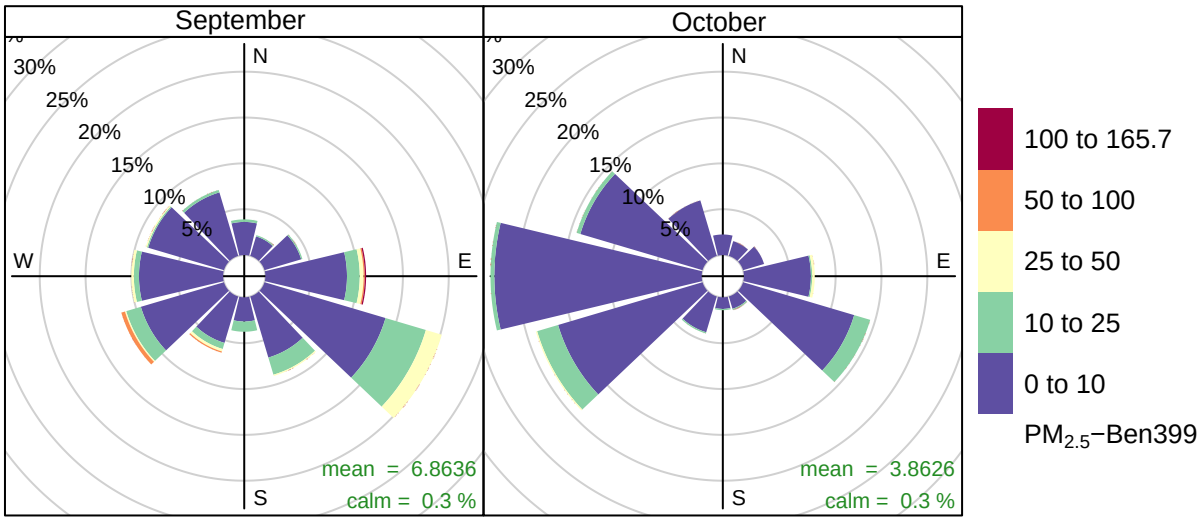
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

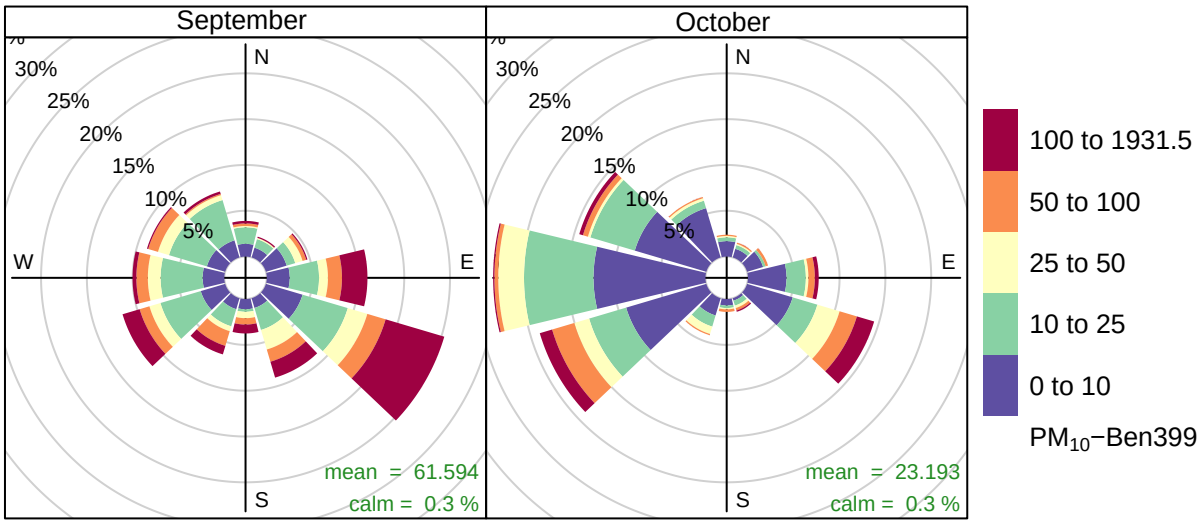


$PM_{2.5}$ pollution rose at Ben399



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

November 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
November 2022 - November 2022

Daily Averages

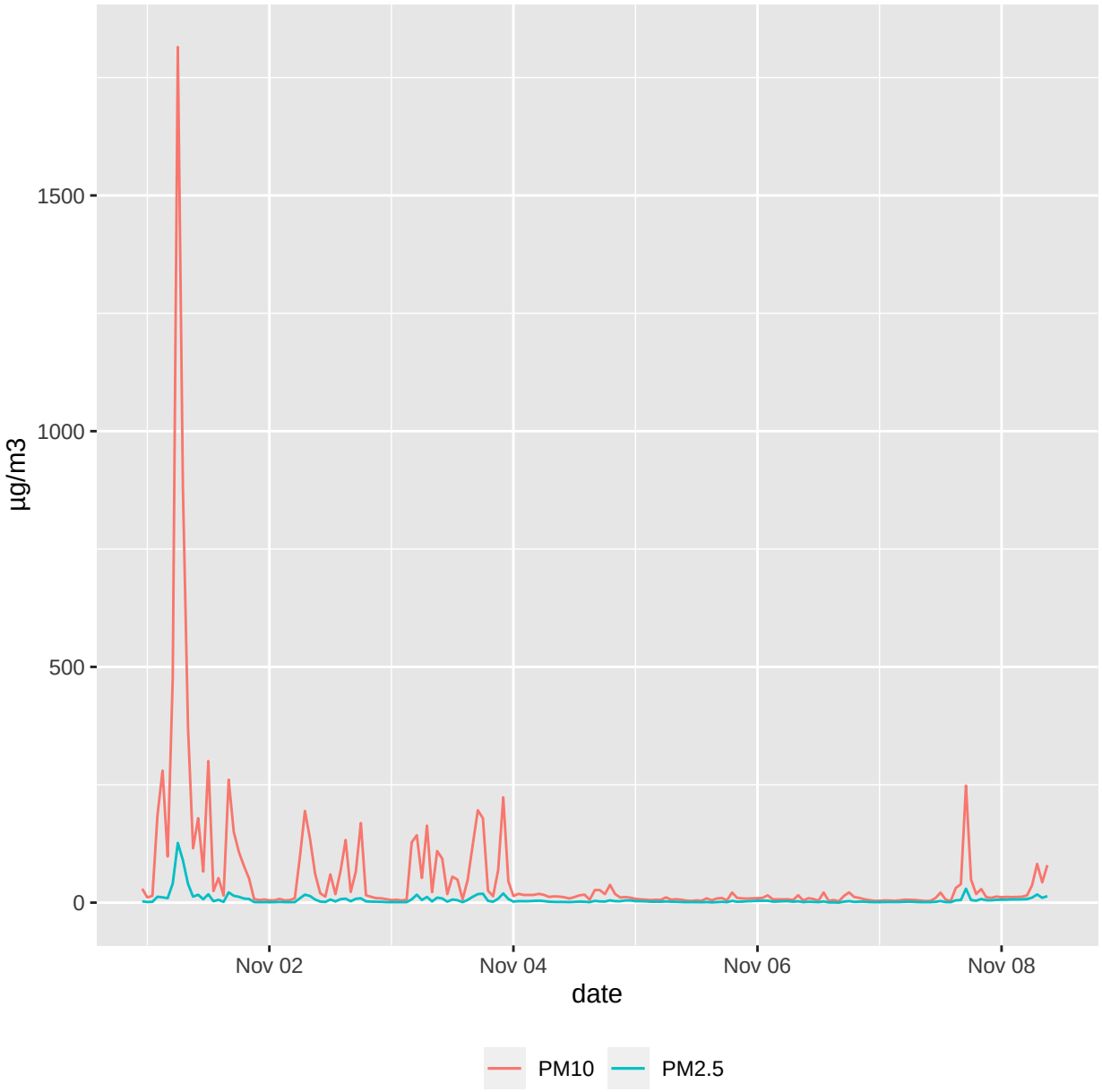
	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-11-01	19.4	231.2	100.0	100.0
2022-11-02	4.7	47.7	100.0	100.0
2022-11-03	7.5	74.4	100.0	100.0
2022-11-04	2.7	16.1	100.0	100.0
2022-11-05	1.9	7.6	100.0	100.0
2022-11-06	2.1	9.1	100.0	100.0
2022-11-07	4.0	22.6	100.0	100.0
2022-11-08	NA	NA	41.7	41.7

Monthly Average

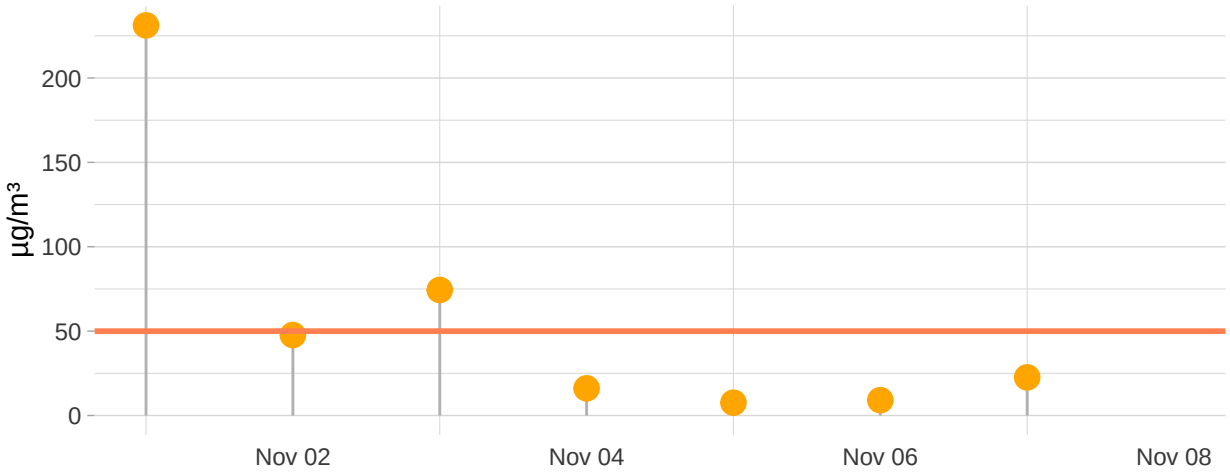
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
November 2022	NA	NA	NA	NA

NA - Not enough data to calculate averages

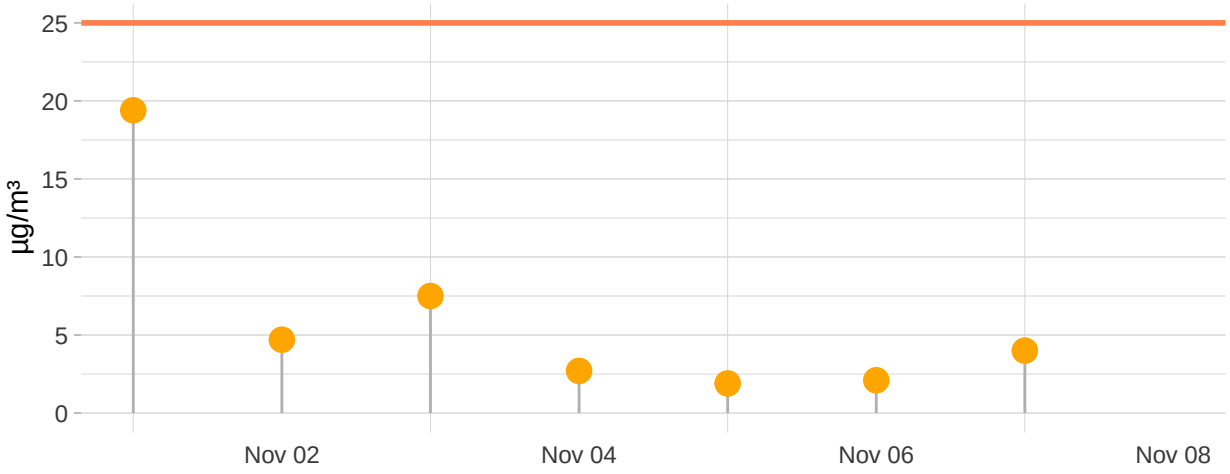
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

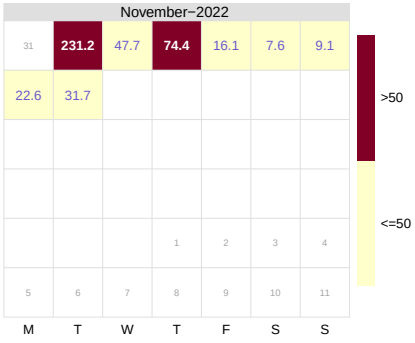


BENNETT RESOURCES

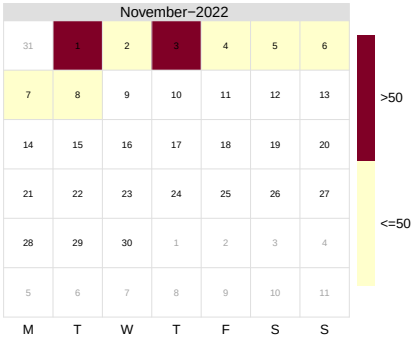
SITE: Ben399
Bi-Monthly Report
November 2022 - November 2022

Daily Exceedances

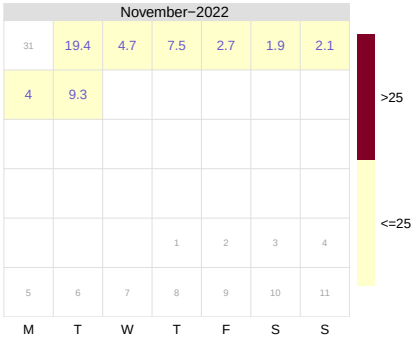
PM_{10}. Daily Exceedances at Ben399



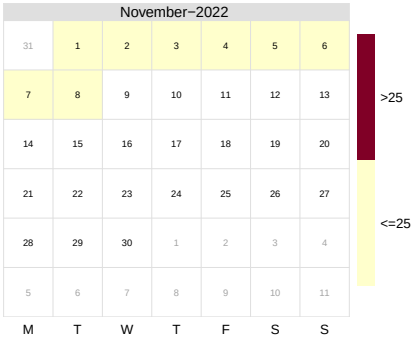
PM_{10}. Days with Exceedances at Ben399



$PM_{2.5}$. Daily Exceedances at Ben399



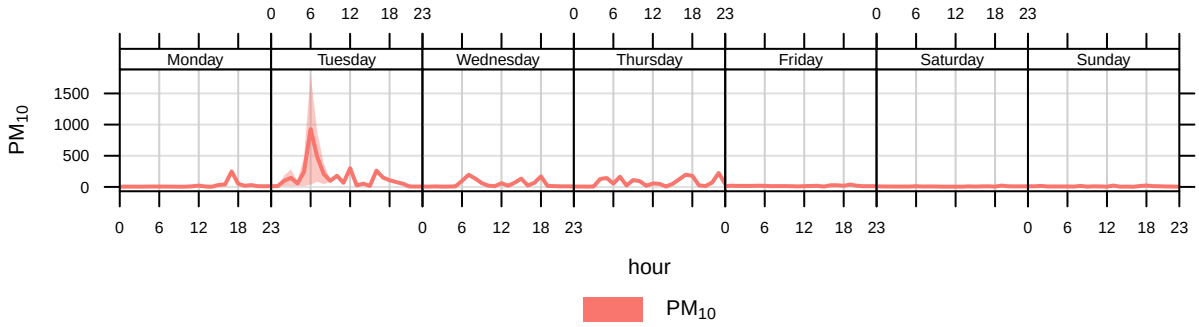
$PM_{2.5}$. Days with Exceedances at Ben399

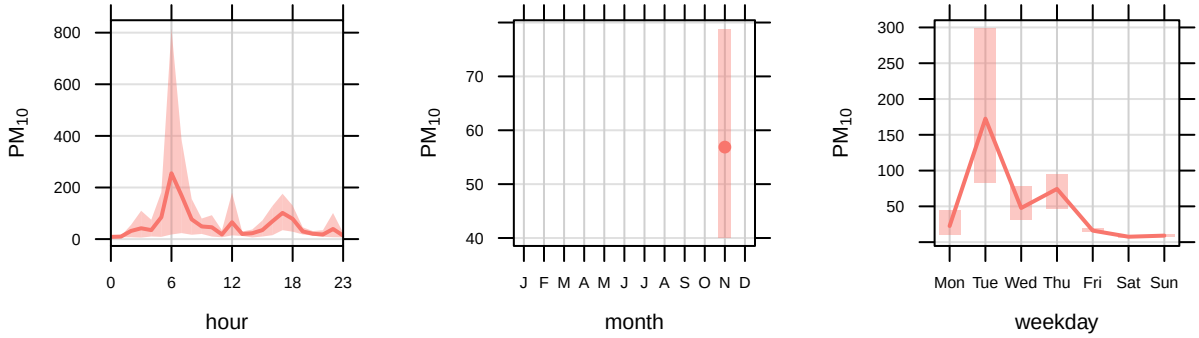


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
November 2022 - November 2022

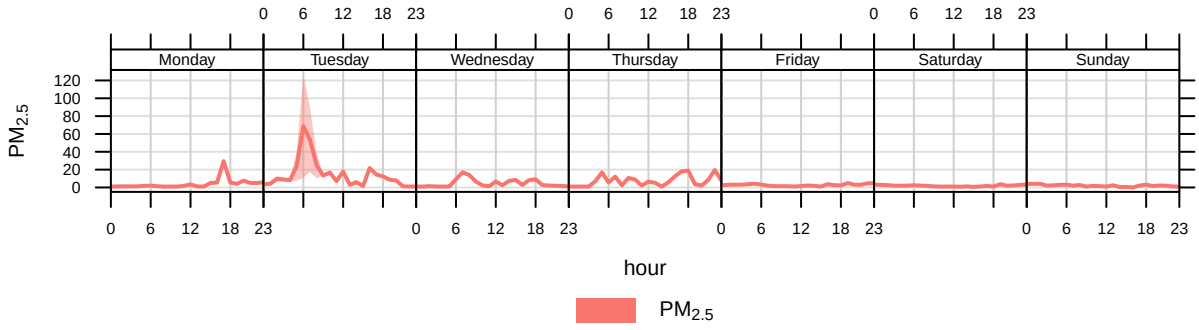
PM_{10} Time variation at Ben399

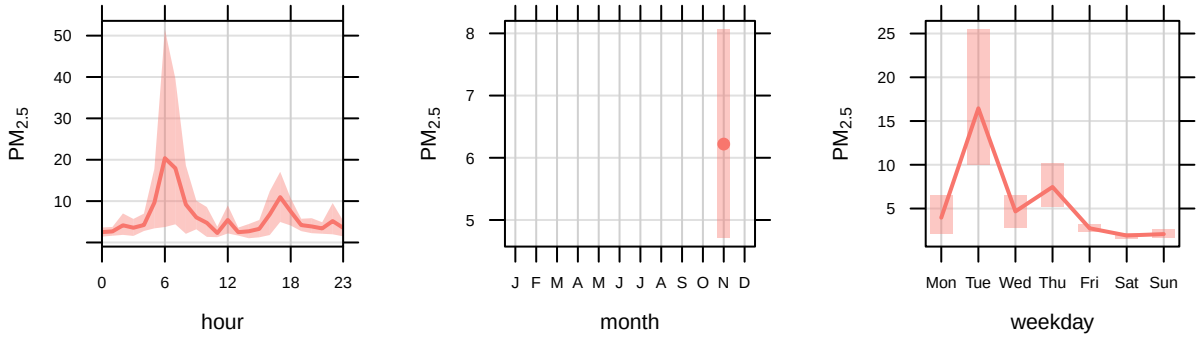




mean and 95% confidence interval in mean

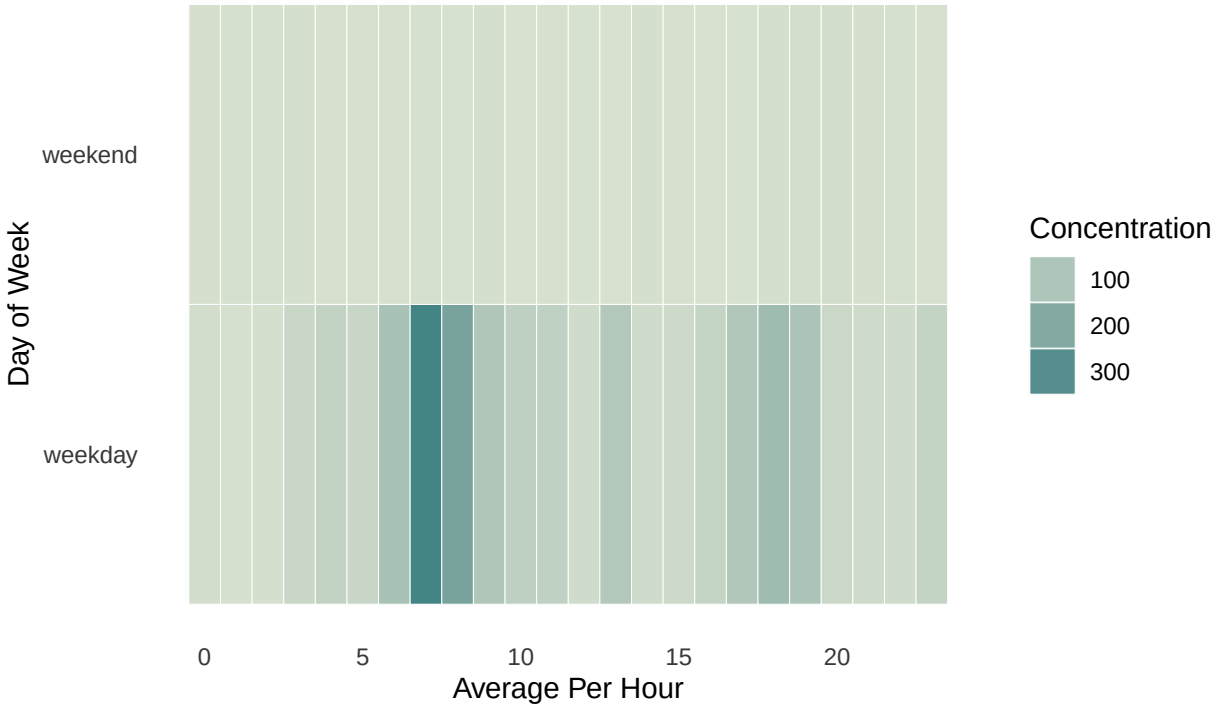
$PM_{2.5}$ Time variation at Ben399



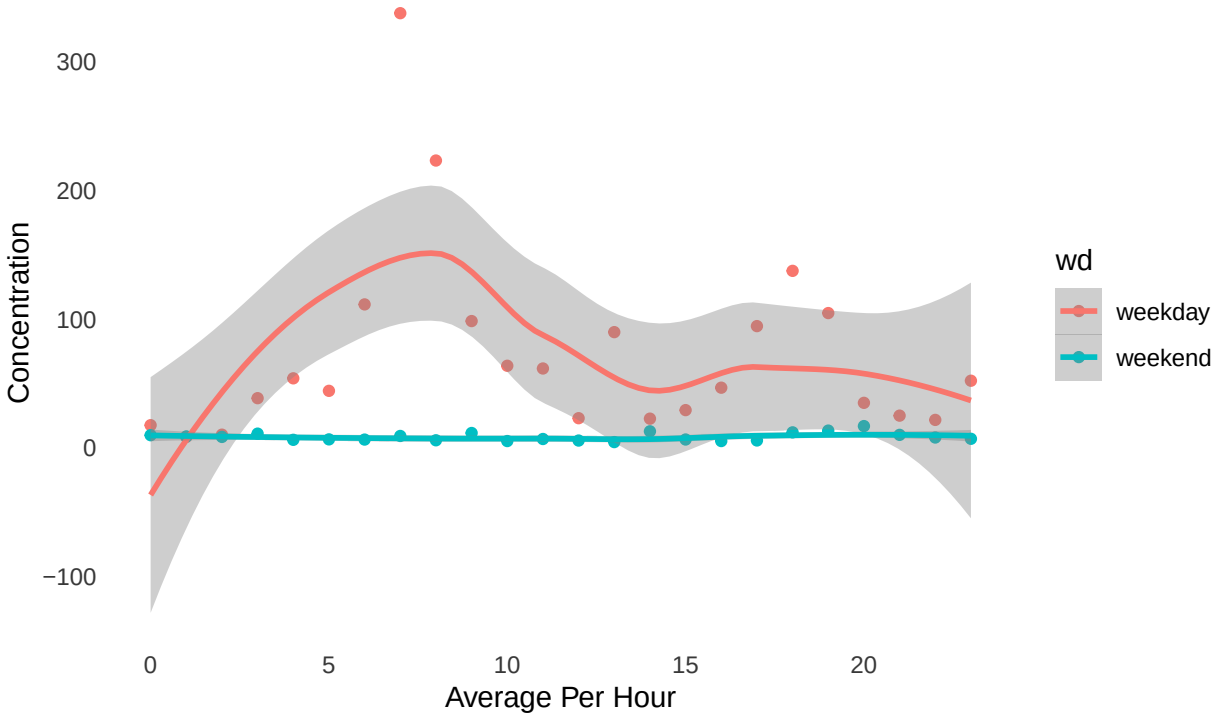


mean and 95% confidence interval in mean

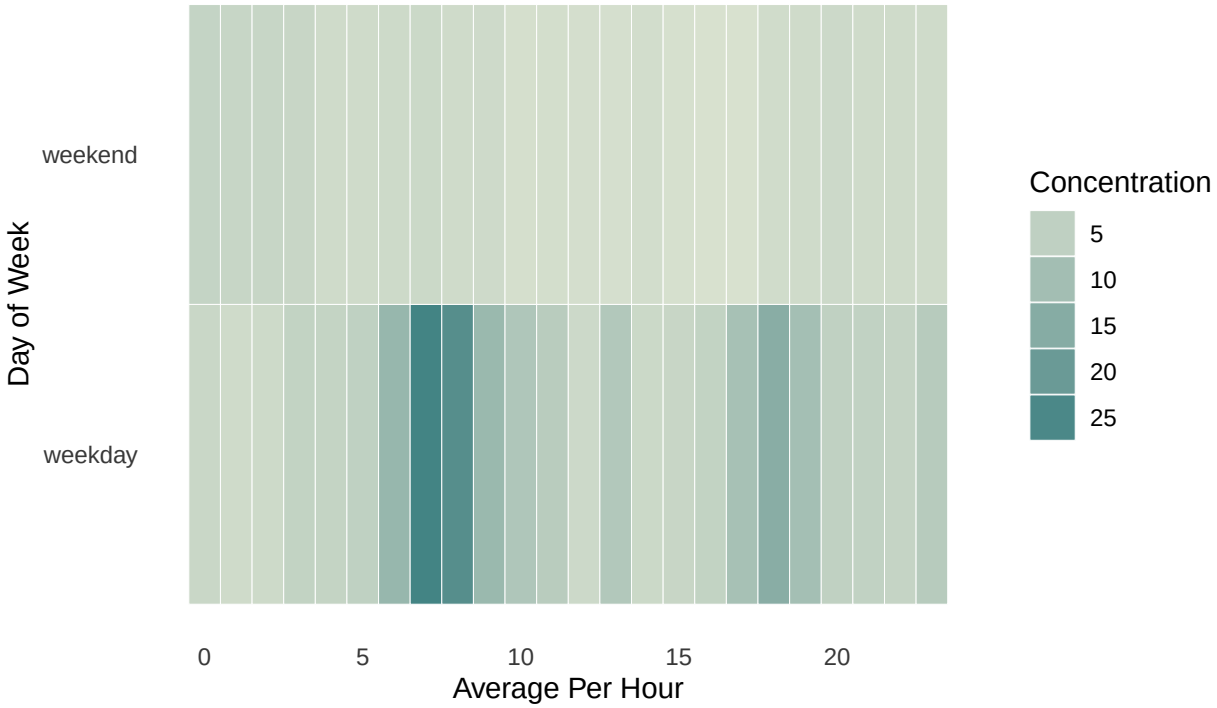
PM10 concentration by Weekday/weekend and Hour



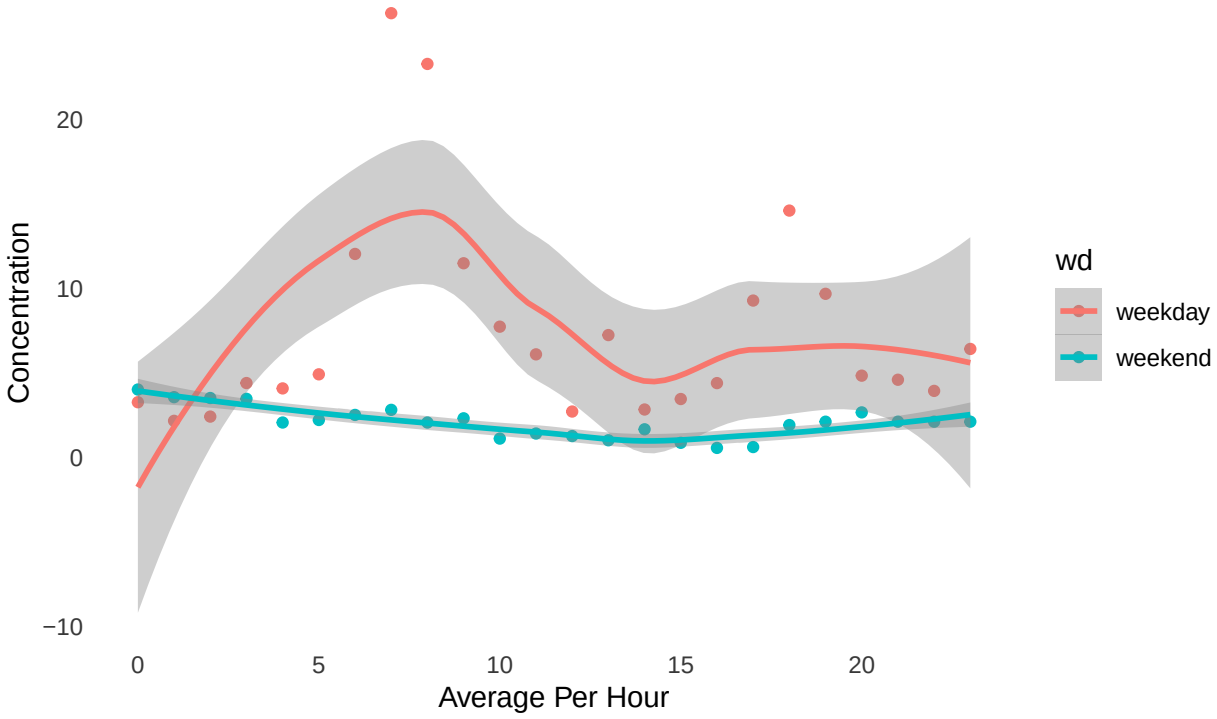
PM10 concentration by weekday and weekend with trend



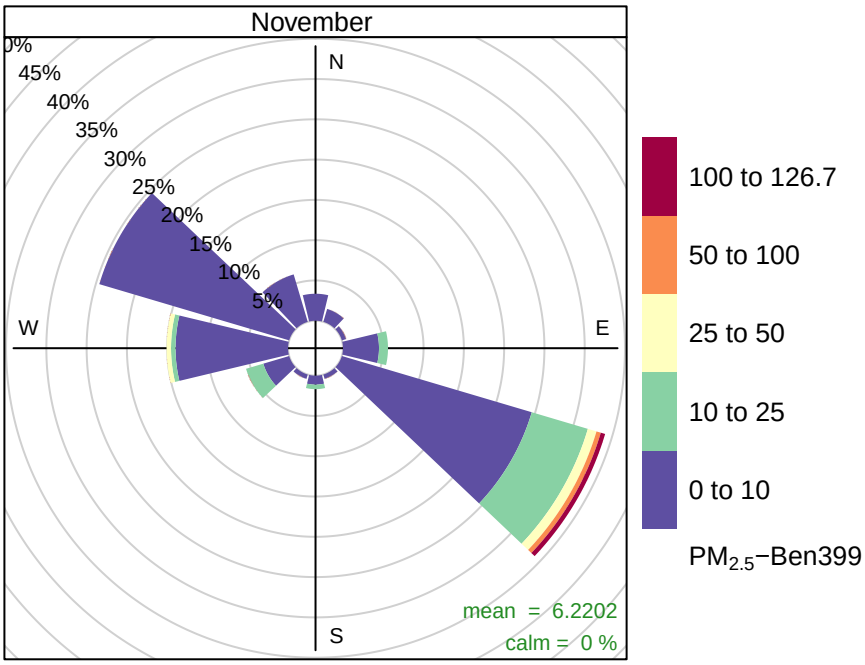
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

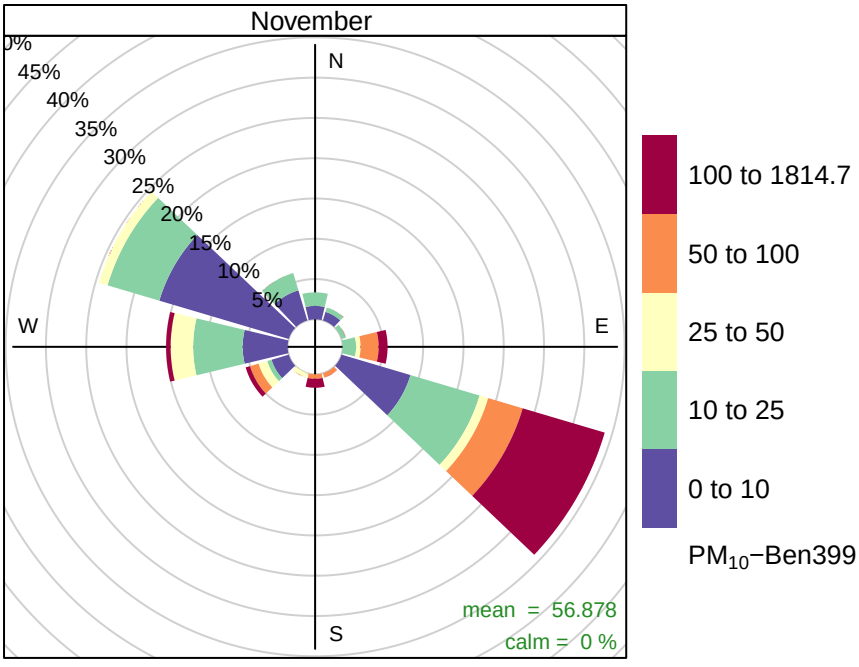


$PM_{2.5}$ pollution rose at Ben399



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Appendix H.2 2022 Data

Bi-Monthly Air Quality Reports 2022 [BEN397]

May-June 2022

BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
May 2022 - June 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-05-03	NA	NA	54.2	54.2
2022-05-04	2.4	16.6	100.0	100.0
2022-05-05	1.2	11.8	100.0	100.0
2022-05-06	3.0	16.0	100.0	100.0
2022-05-07	1.1	5.3	100.0	100.0
2022-05-08	1.1	7.2	100.0	100.0
2022-05-09	0.9	6.3	100.0	100.0
2022-05-10	1.2	12.1	100.0	100.0
2022-05-11	1.7	14.1	100.0	100.0
2022-05-12	9.7	110.6	100.0	100.0
2022-05-13	7.7	75.5	95.8	95.8
2022-05-14	3.0	23.4	100.0	100.0
2022-05-15	2.5	25.7	100.0	100.0
2022-05-16	6.6	74.0	100.0	100.0
2022-05-17	7.8	77.8	100.0	100.0
2022-05-18	6.8	64.6	100.0	100.0
2022-05-19	1.2	11.8	100.0	100.0
2022-05-20	1.3	12.5	95.8	95.8
2022-05-21	6.1	85.8	95.8	95.8
2022-05-22	1.4	14.4	95.8	95.8
2022-05-23	1.3	12.9	95.8	95.8
2022-05-24	2.2	15.5	100.0	100.0
2022-05-25	2.2	17.4	100.0	100.0
2022-05-26	8.2	62.4	100.0	100.0
2022-05-27	13.9	138.9	100.0	100.0
2022-05-28	4.2	26.4	100.0	100.0
2022-05-29	4.1	39.4	95.8	95.8
2022-05-30	2.4	21.6	100.0	100.0
2022-05-31	2.0	11.2	100.0	100.0
2022-06-01	1.2	5.5	95.8	95.8
2022-06-02	1.1	4.4	87.5	87.5
2022-06-03	0.7	2.2	100.0	100.0
2022-06-04	0.4	4.9	100.0	100.0
2022-06-05	1.0	14.4	100.0	100.0
2022-06-06	0.3	6.8	95.8	95.8
2022-06-07	3.3	25.3	100.0	100.0
2022-06-08	1.5	10.3	100.0	100.0
2022-06-09	2.3	8.7	95.8	95.8
2022-06-10	1.1	7.7	100.0	100.0
2022-06-11	1.1	7.9	100.0	100.0
2022-06-12	6.2	172.6	100.0	100.0
2022-06-13	2.7	33.7	100.0	100.0
2022-06-14	3.4	50.2	100.0	100.0
2022-06-15	3.5	39.5	95.8	95.8
2022-06-16	1.0	11.9	100.0	100.0

(continued)

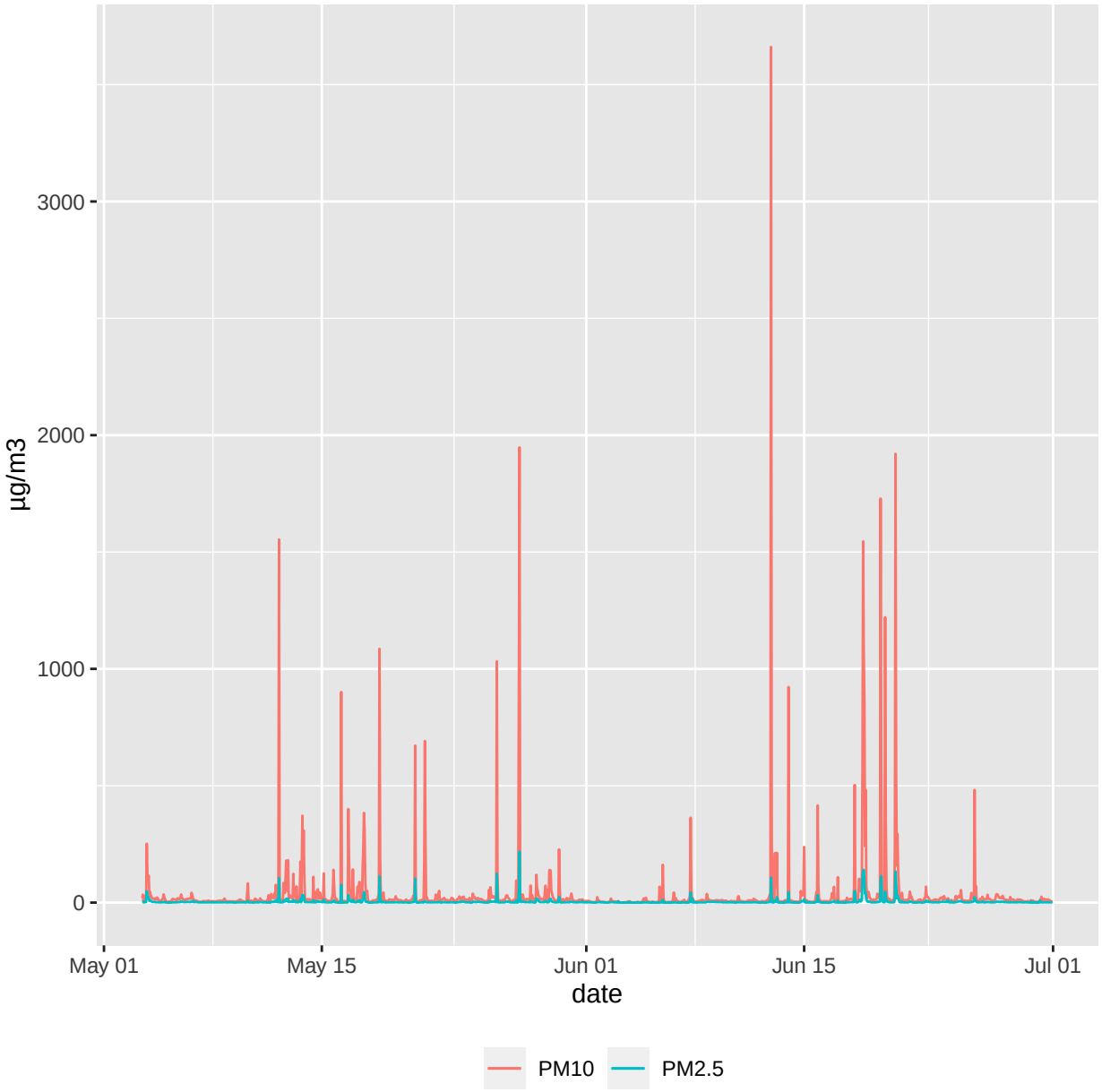
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-06-17	1.1	12.7	95.8	95.8
2022-06-18	28.5	244.5	100.0	100.0
2022-06-19	13.5	136.5	83.3	83.3
2022-06-20	15.9	207.3	95.8	95.8
2022-06-21	4.7	35.7	100.0	100.0
2022-06-22	1.5	13.9	95.8	95.8
2022-06-23	1.8	12.5	91.7	91.7
2022-06-24	3.0	14.3	100.0	100.0
2022-06-25	3.7	36.2	100.0	100.0
2022-06-26	2.4	18.3	100.0	100.0
2022-06-27	2.4	18.5	100.0	100.0
2022-06-28	1.5	11.5	100.0	100.0
2022-06-29	1.0	5.5	100.0	100.0
2022-06-30	1.5	9.5	91.7	91.7

Monthly Average

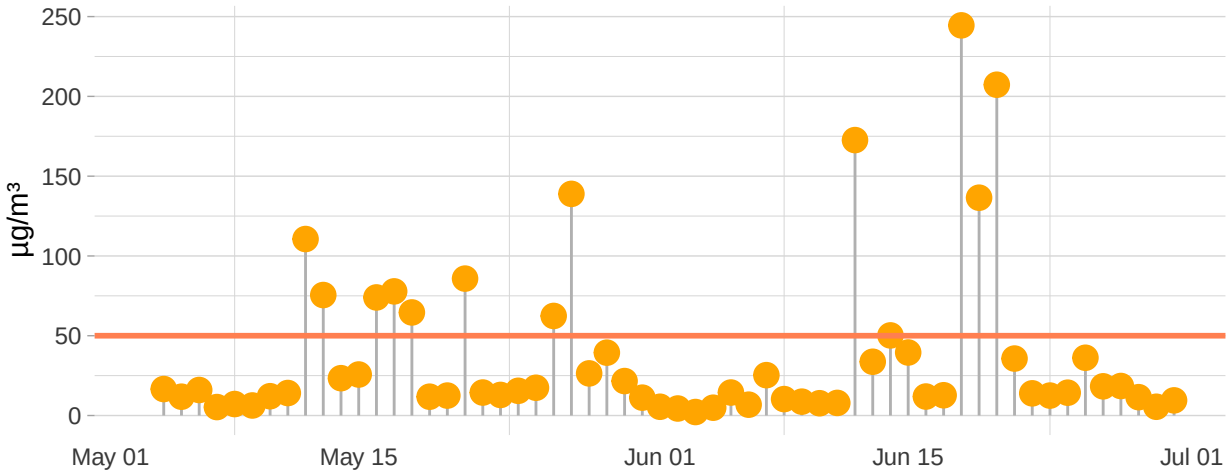
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
May 2022	3.828571	36.11429	97.55172	97.55172
June 2022	3.776667	39.43000	97.49333	97.49333

NA - Not enough data to calculate averages

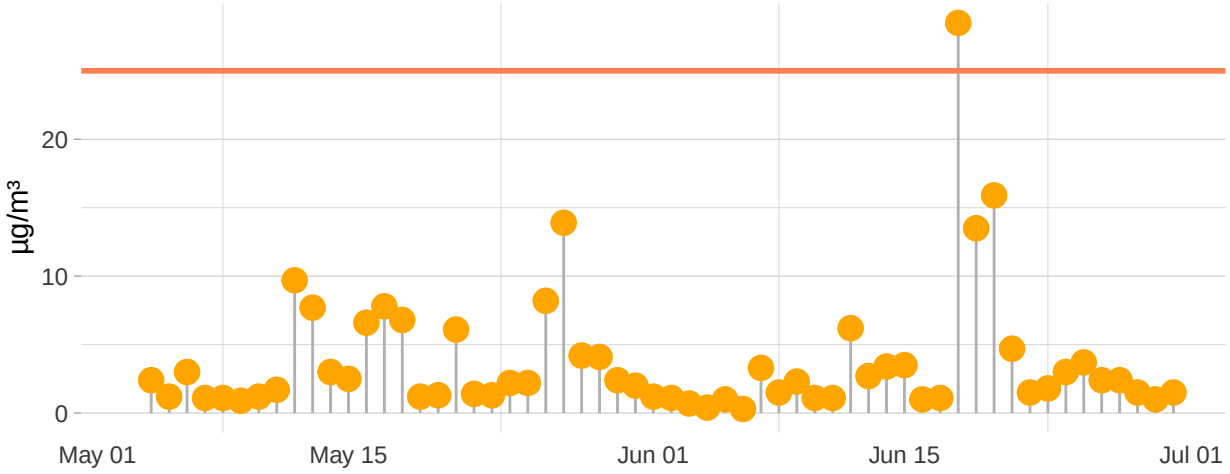
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

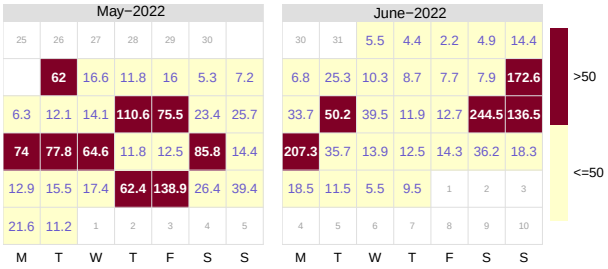


BENNETT RESOURCES

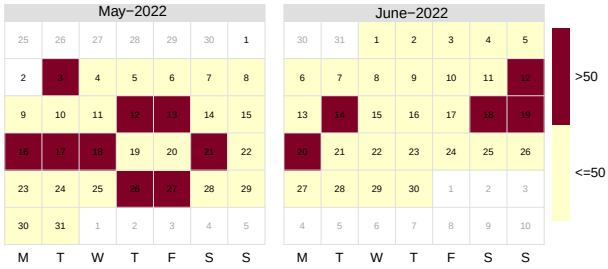
SITE: Ben397
Bi-Monthly Report
May 2022 - June 2022

Daily Exceedances

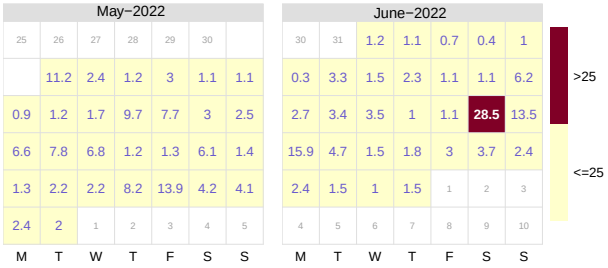
PM$_{10}$. Daily Exceedances at Ben397



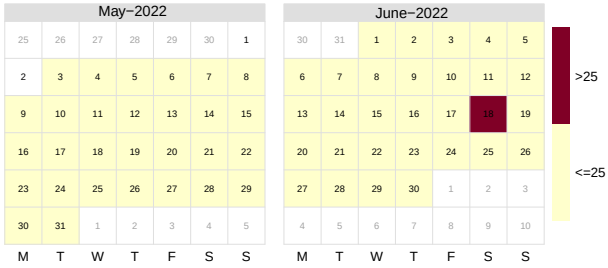
PM$_{10}$. Days with Exceedances at Ben397



PM$_{2.5}$. Daily Exceedances at Ben397



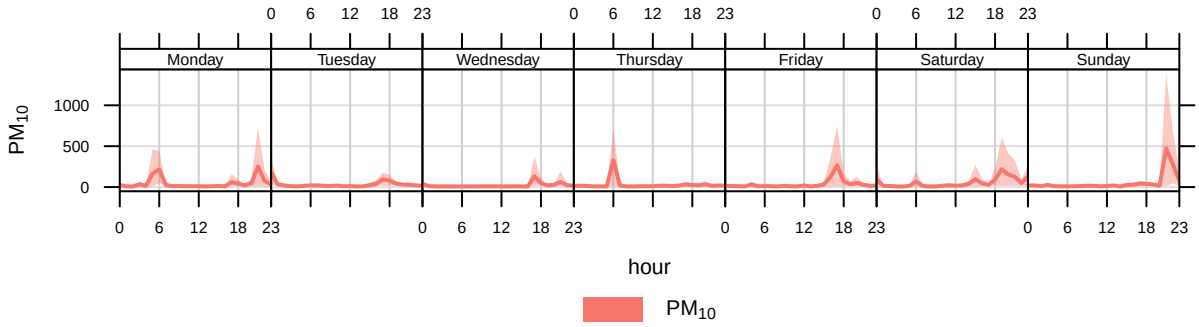
PM$_{2.5}$. Days with Exceedances at Ben397

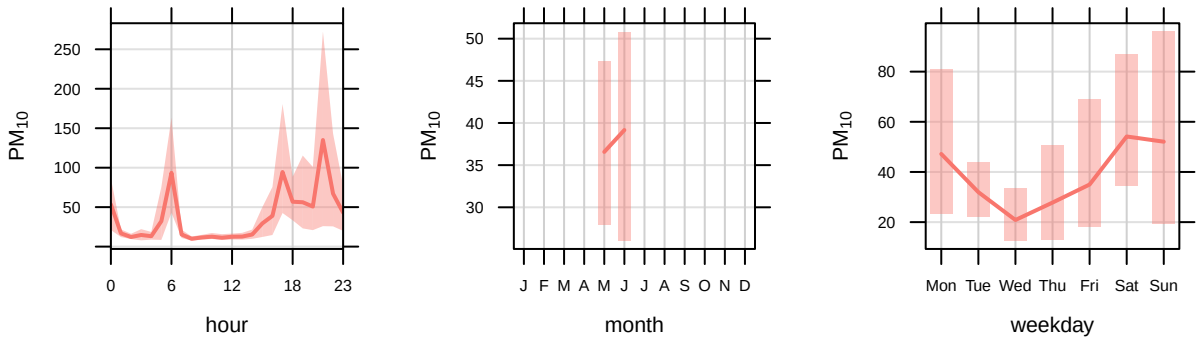


BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
May 2022 - June 2022

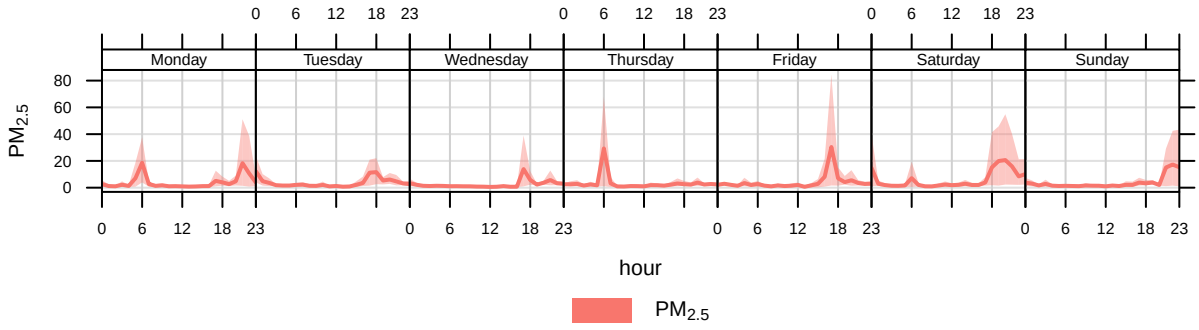
PM_{10} Time variation at Ben397

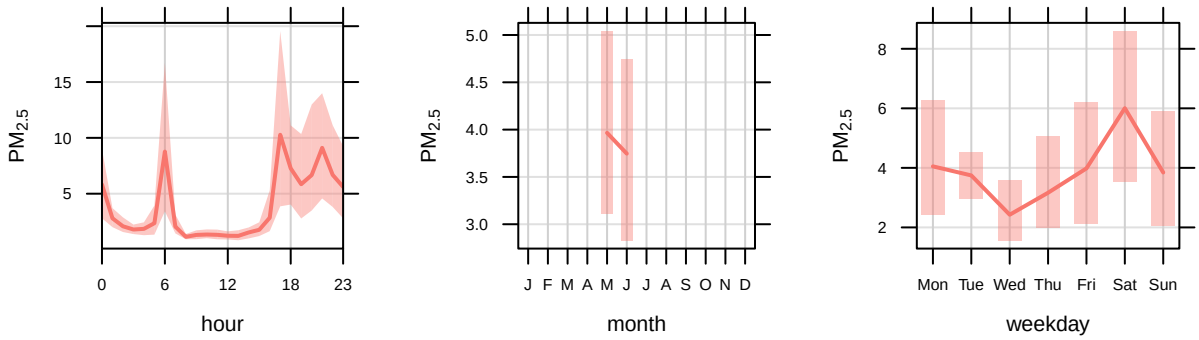




mean and 95% confidence interval in mean

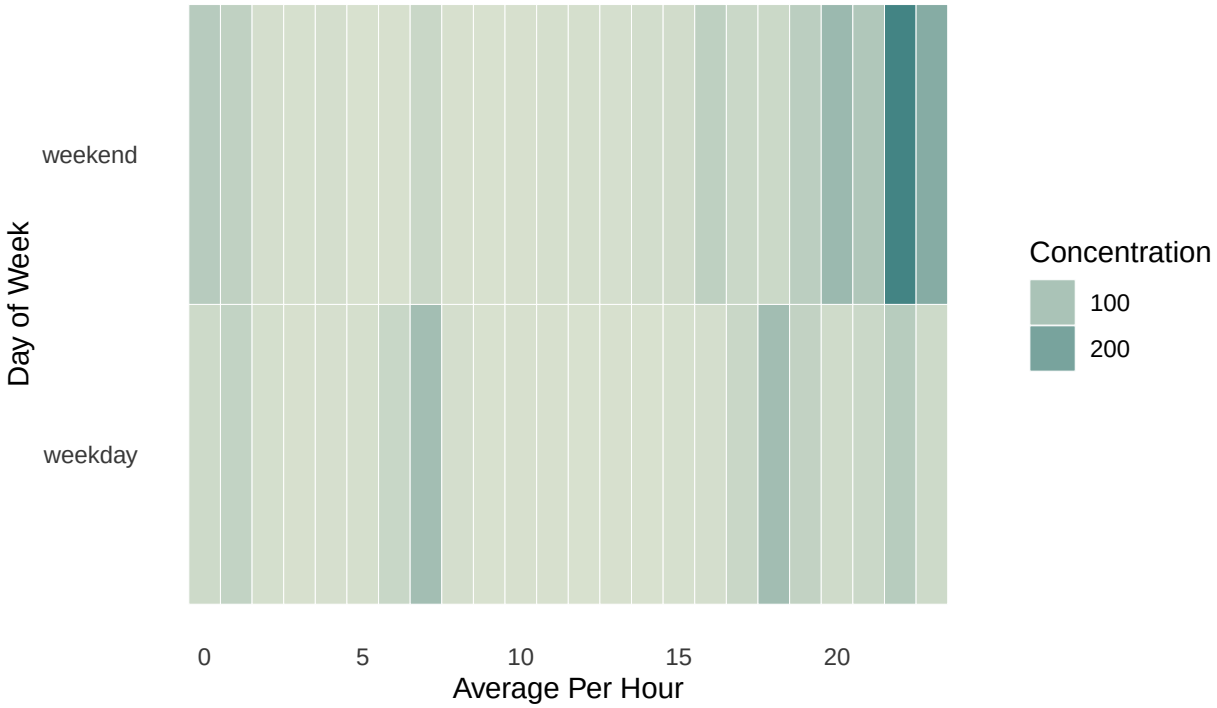
$PM_{2.5}$ Time variation at Ben397



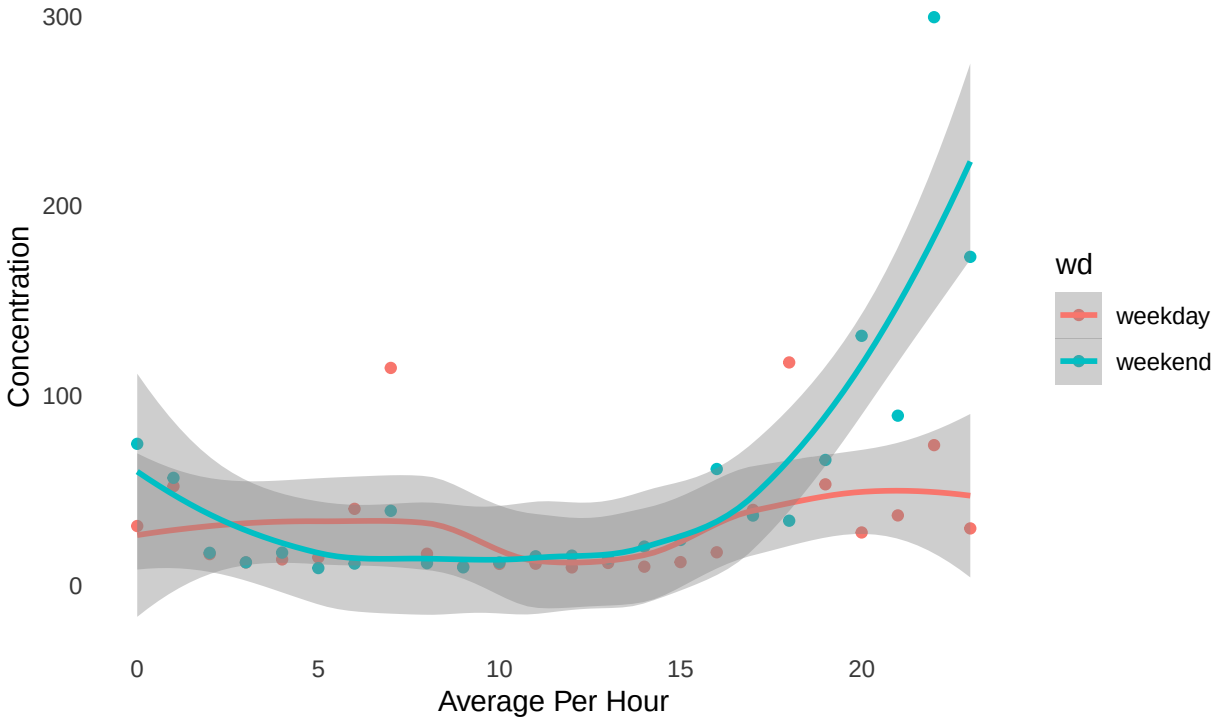


mean and 95% confidence interval in mean

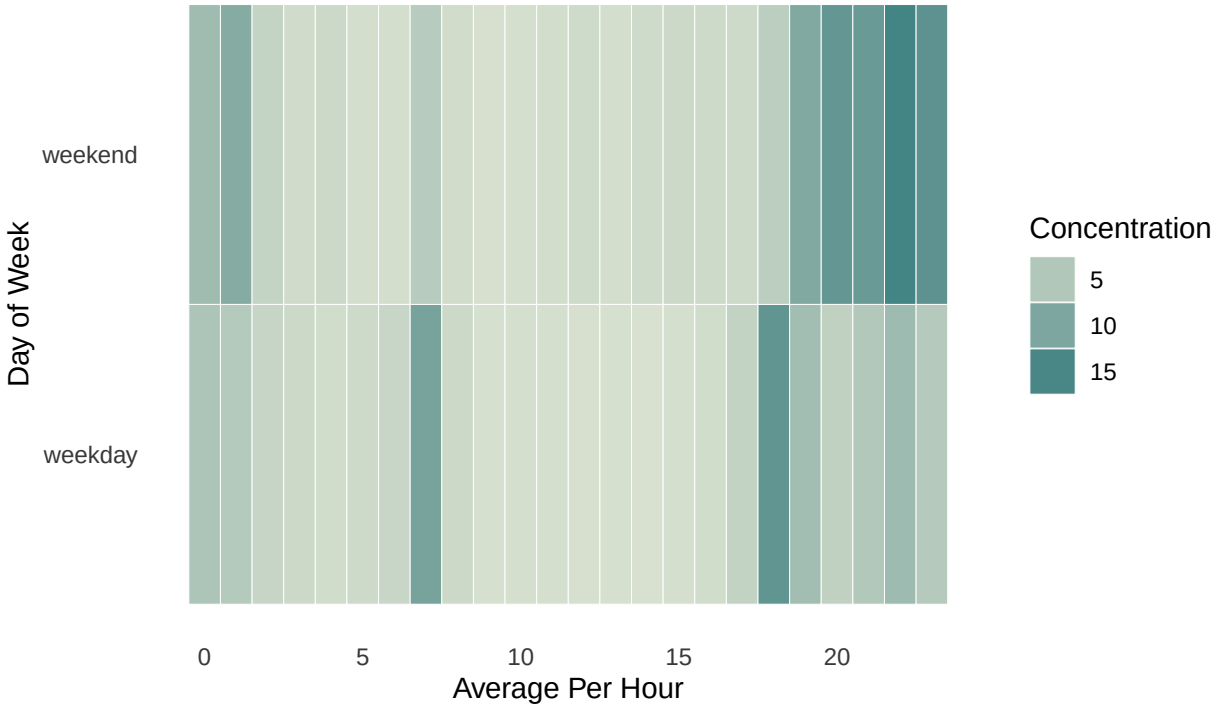
PM10 concentration by Weekday/weekend and Hour



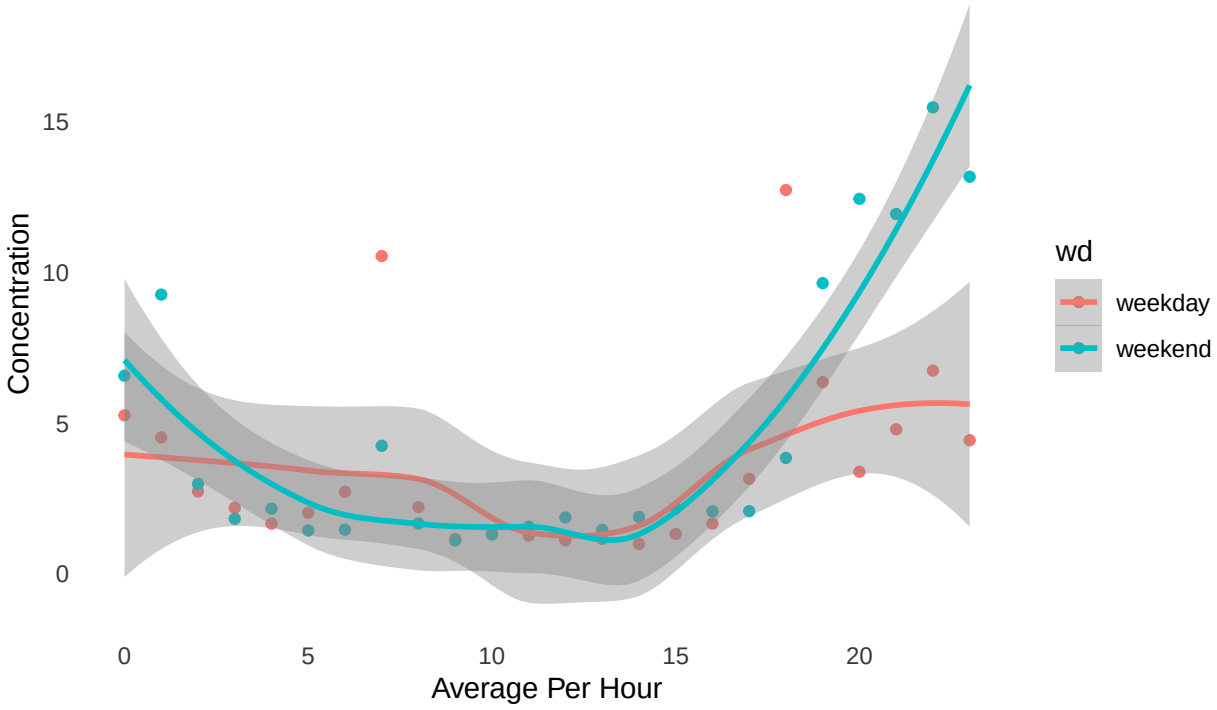
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN397]

July-August 2022

BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
July 2022 - August 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-07-01	2.0	13.5	100.0	100.0
2022-07-02	2.0	14.2	100.0	100.0
2022-07-03	1.9	14.2	100.0	100.0
2022-07-04	1.4	8.9	100.0	100.0
2022-07-05	2.2	16.9	100.0	100.0
2022-07-06	5.1	56.8	100.0	100.0
2022-07-07	17.6	165.2	100.0	100.0
2022-07-08	7.9	56.8	87.5	87.5
2022-07-09	4.4	36.2	95.8	95.8
2022-07-10	2.0	12.4	95.8	95.8
2022-07-11	6.0	44.5	91.7	91.7
2022-07-12	2.5	11.7	87.5	87.5
2022-07-13	3.3	27.4	91.7	91.7
2022-07-14	3.1	28.1	91.7	91.7
2022-07-15	4.0	34.5	95.8	95.8
2022-07-16	3.2	21.6	100.0	100.0
2022-07-17	12.2	75.9	95.8	95.8
2022-07-18	26.8	206.9	100.0	100.0
2022-07-19	21.2	244.8	95.8	95.8
2022-07-20	12.6	77.4	91.7	91.7
2022-07-21	26.5	304.0	95.8	95.8
2022-07-22	8.4	81.1	100.0	100.0
2022-07-23	22.2	202.9	100.0	100.0
2022-07-24	15.4	109.7	95.8	95.8
2022-07-25	4.5	40.4	91.7	91.7
2022-07-26	1.6	11.1	100.0	100.0
2022-07-27	2.4	17.3	83.3	83.3
2022-07-28	1.7	9.4	91.7	91.7
2022-07-29	4.8	26.0	100.0	100.0
2022-07-30	34.9	350.2	100.0	100.0
2022-07-31	21.1	177.7	95.8	95.8
2022-08-01	14.5	205.8	95.8	95.8
2022-08-02	12.6	160.3	100.0	100.0
2022-08-03	13.4	170.1	91.7	91.7
2022-08-04	14.4	148.3	91.7	91.7
2022-08-05	3.7	18.2	95.8	95.8
2022-08-06	2.8	15.4	100.0	100.0
2022-08-07	16.1	125.3	100.0	100.0
2022-08-08	11.1	103.7	91.7	91.7
2022-08-09	19.8	228.3	100.0	100.0
2022-08-10	3.8	25.9	100.0	100.0
2022-08-11	1.7	13.1	100.0	100.0
2022-08-12	1.3	11.8	95.8	95.8
2022-08-13	4.5	30.3	100.0	100.0
2022-08-14	3.1	21.6	91.7	91.7

(continued)

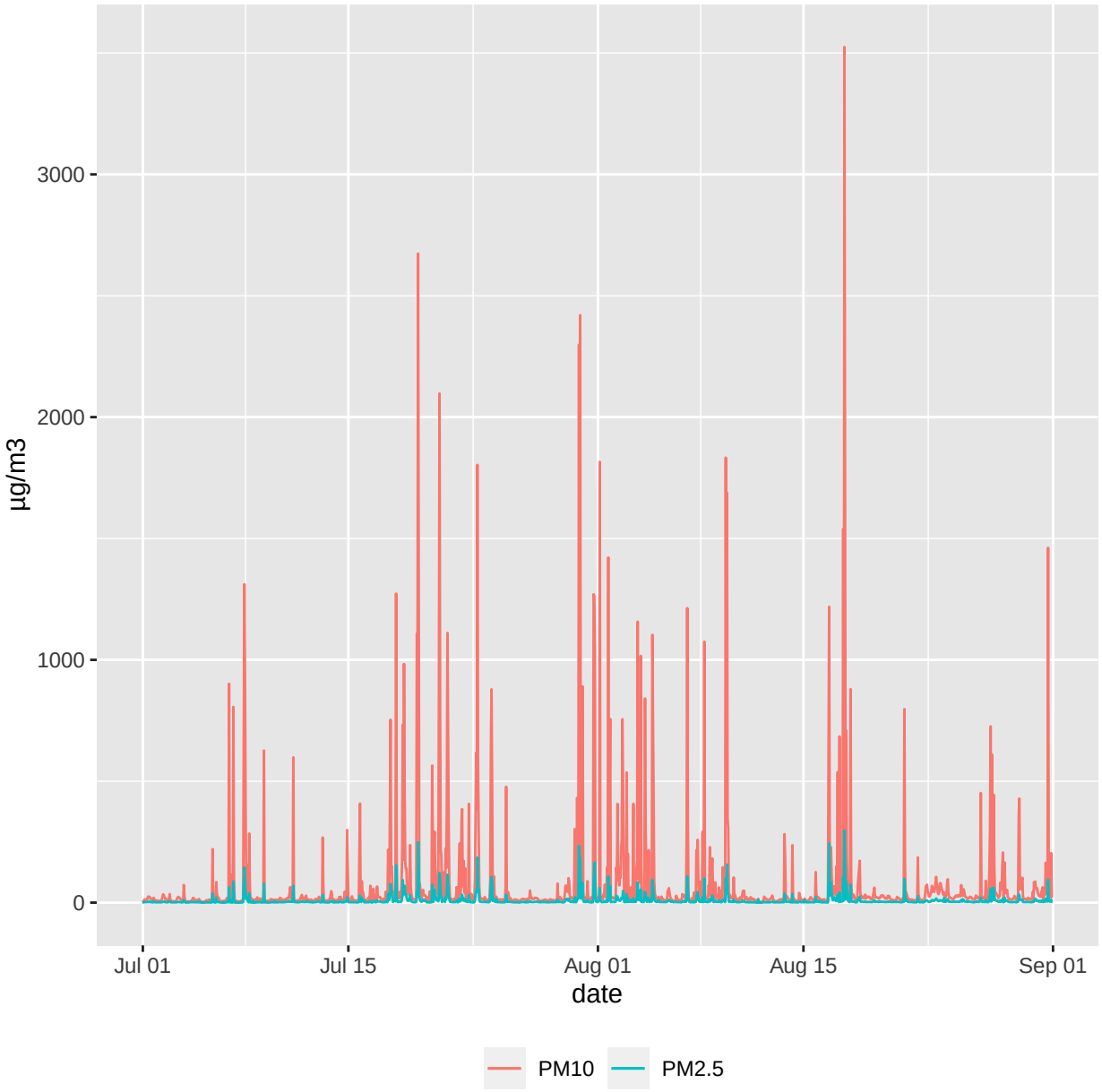
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-08-15	3.2	18.3	100.0	100.0
2022-08-16	25.9	116.5	95.8	95.8
2022-08-17	33.6	353.2	95.8	95.8
2022-08-18	9.1	76.7	91.7	91.7
2022-08-19	3.1	23.8	95.8	95.8
2022-08-20	3.3	21.6	100.0	100.0
2022-08-21	8.1	52.8	100.0	100.0
2022-08-22	4.1	22.8	100.0	100.0
2022-08-23	5.3	35.5	95.8	95.8
2022-08-24	8.3	52.4	100.0	100.0
2022-08-25	4.9	30.0	95.8	95.8
2022-08-26	2.9	18.9	91.7	91.7
2022-08-27	14.6	145.7	100.0	100.0
2022-08-28	8.4	60.6	91.7	91.7
2022-08-29	6.2	60.5	87.5	87.5
2022-08-30	4.4	30.5	100.0	100.0
2022-08-31	9.8	109.0	100.0	100.0

Monthly Average

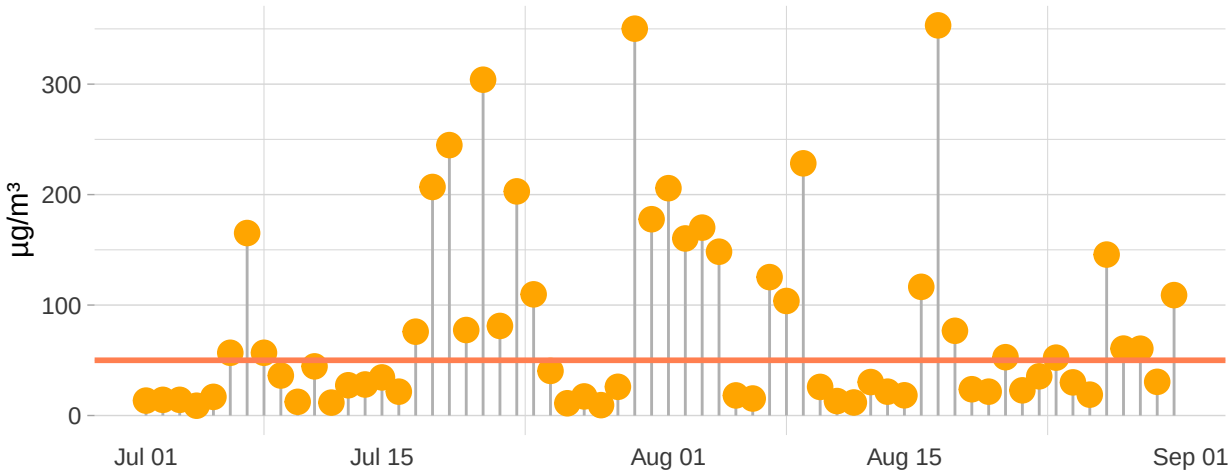
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
July 2022	9.190323	80.57097	95.96452	95.96452
August 2022	8.967742	80.86774	96.63871	96.63871

NA - Not enough data to calculate averages

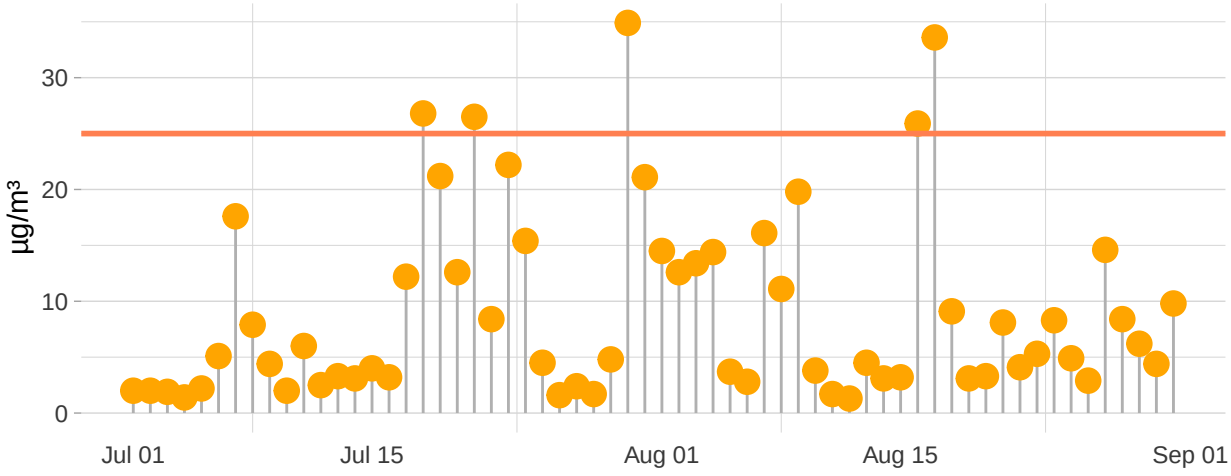
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

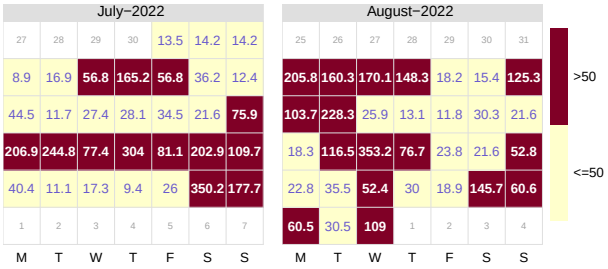


BENNETT RESOURCES

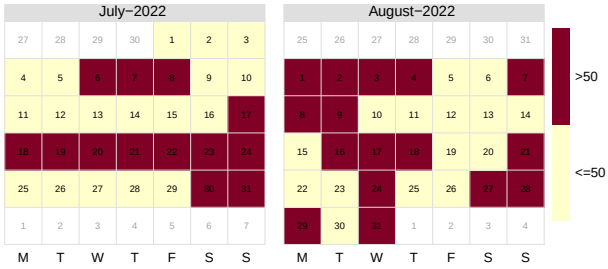
SITE: Ben397
Bi-Monthly Report
July 2022 - August 2022

Daily Exceedances

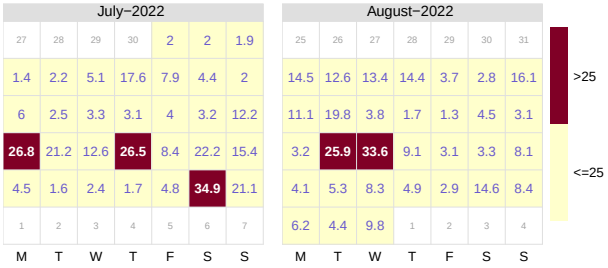
PM_{10}. Daily Exceedances at Ben397



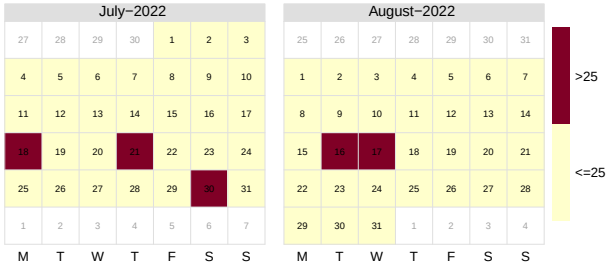
PM_{10}. Days with Exceedances at Ben397



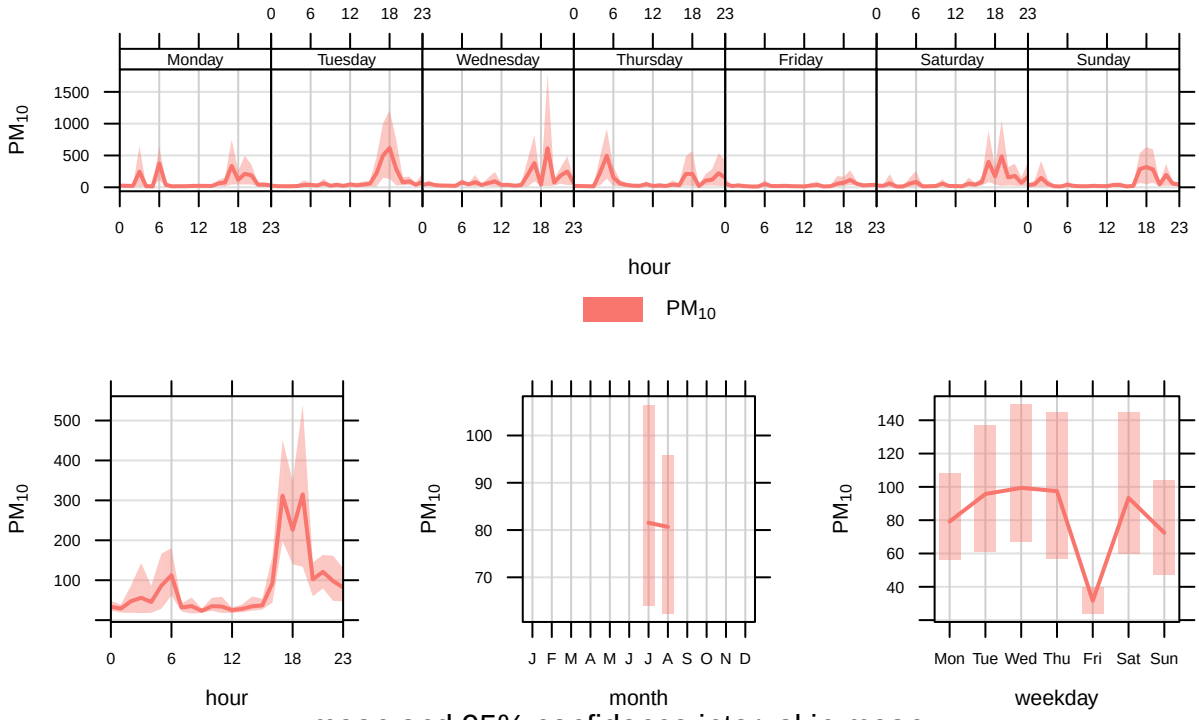
$PM_{2.5}$. Daily Exceedances at Ben397



$PM_{2.5}$. Days with Exceedances at Ben397

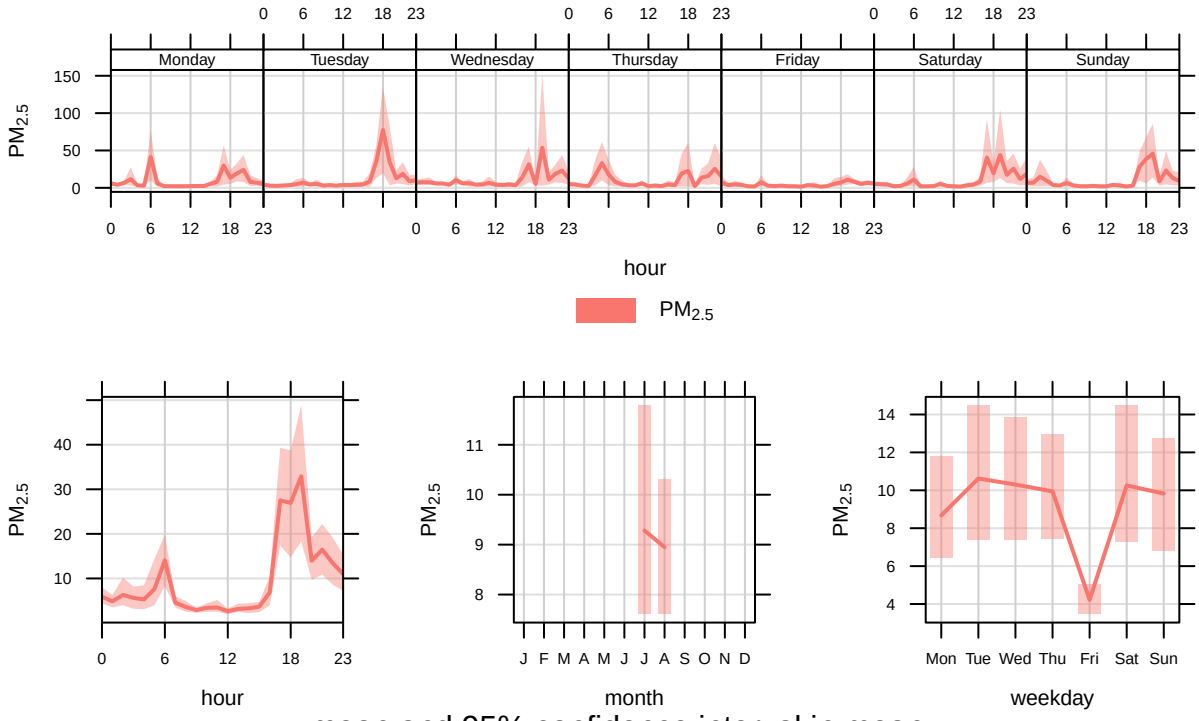


PM_{10} Time variation at Ben397



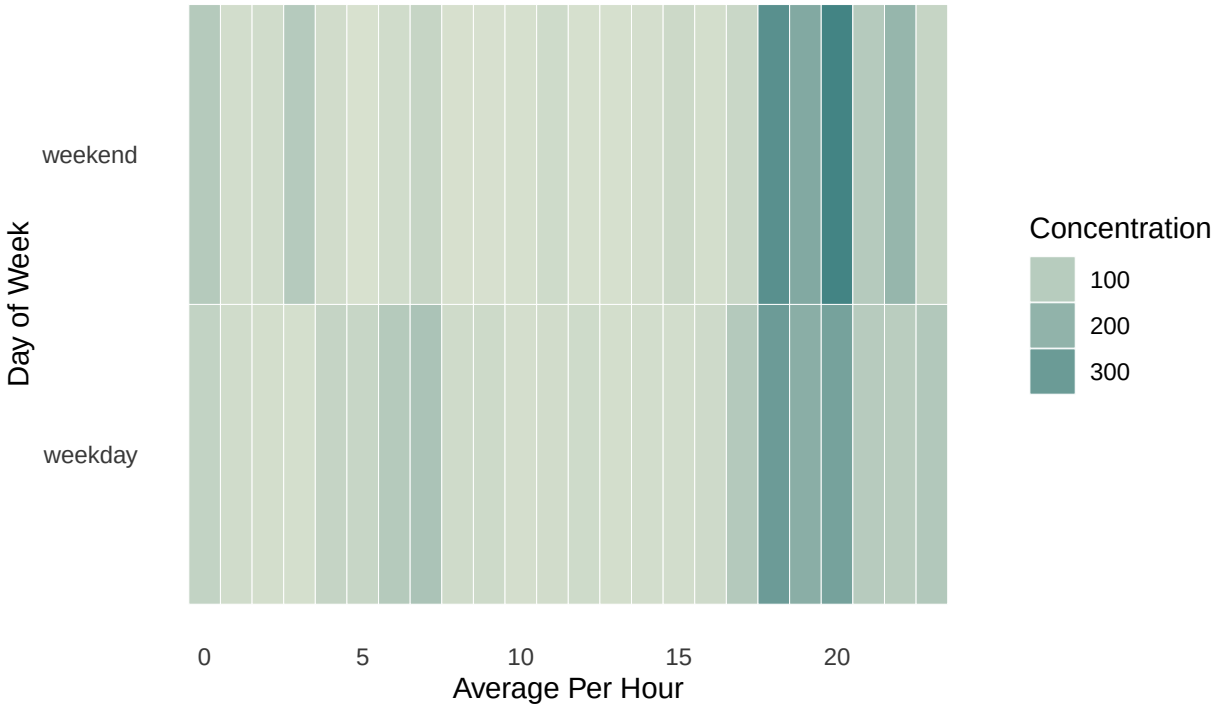
mean and 95% confidence interval in mean

$PM_{2.5}$ Time variation at Ben397

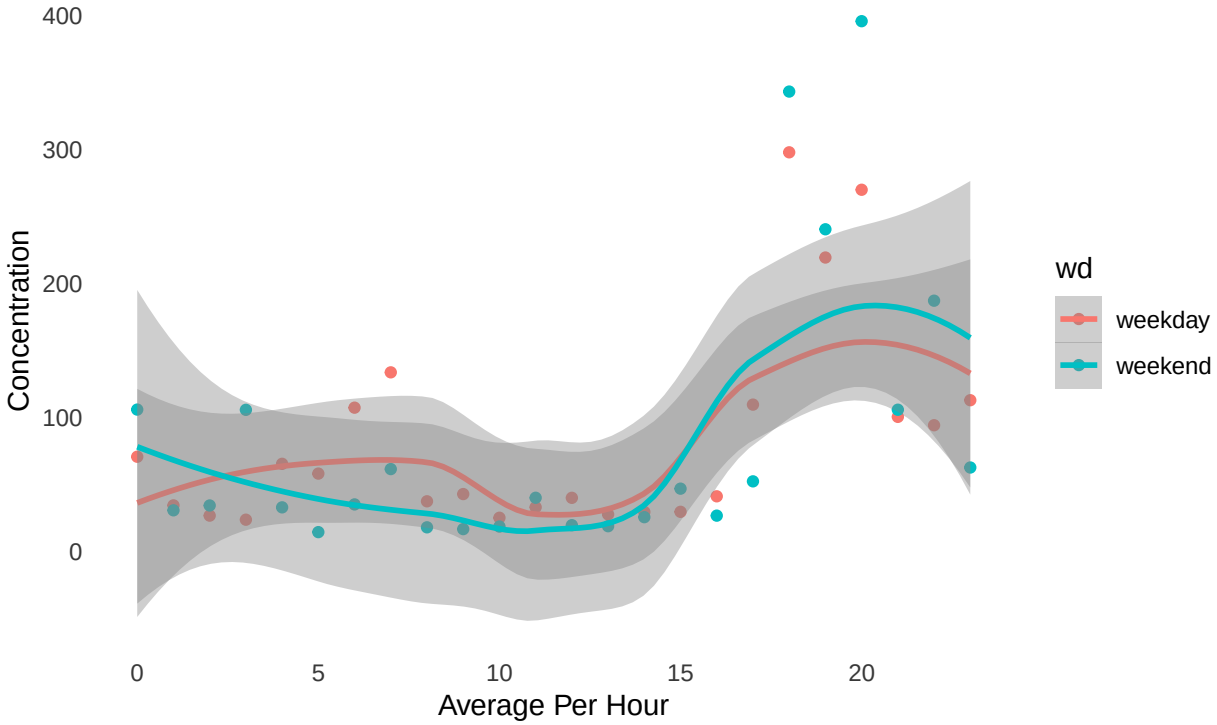


mean and 95% confidence interval in mean

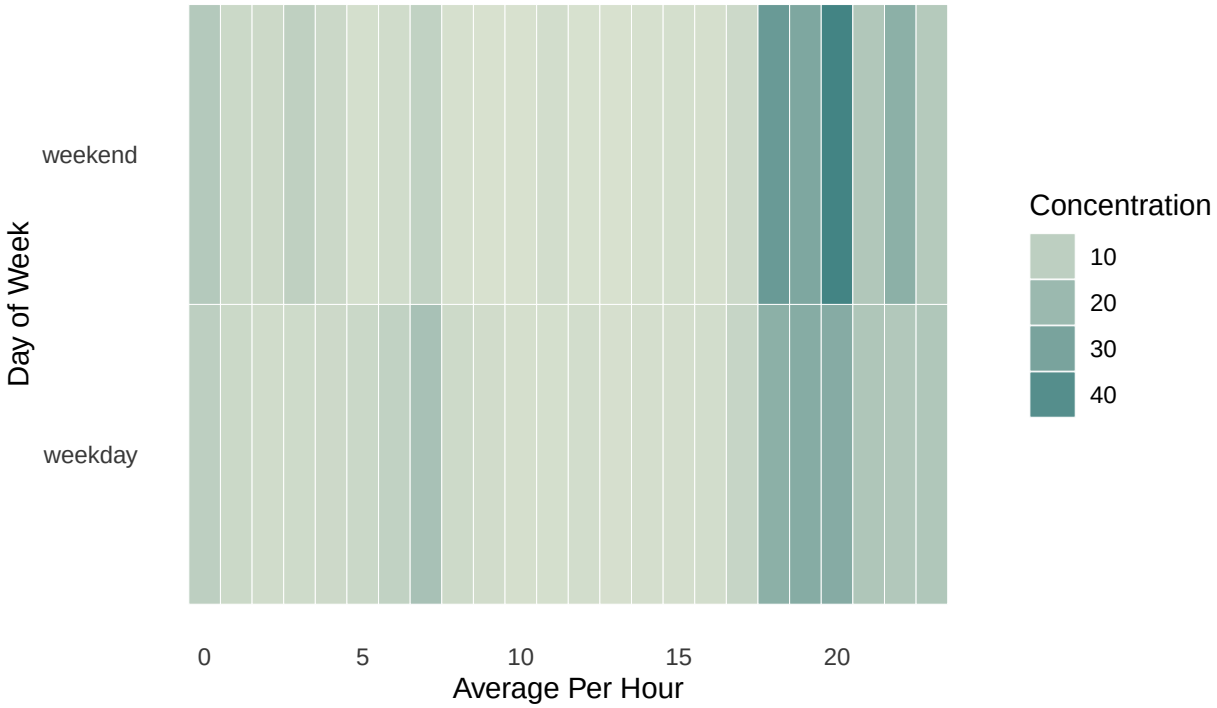
PM10 concentration by Weekday/weekend and Hour



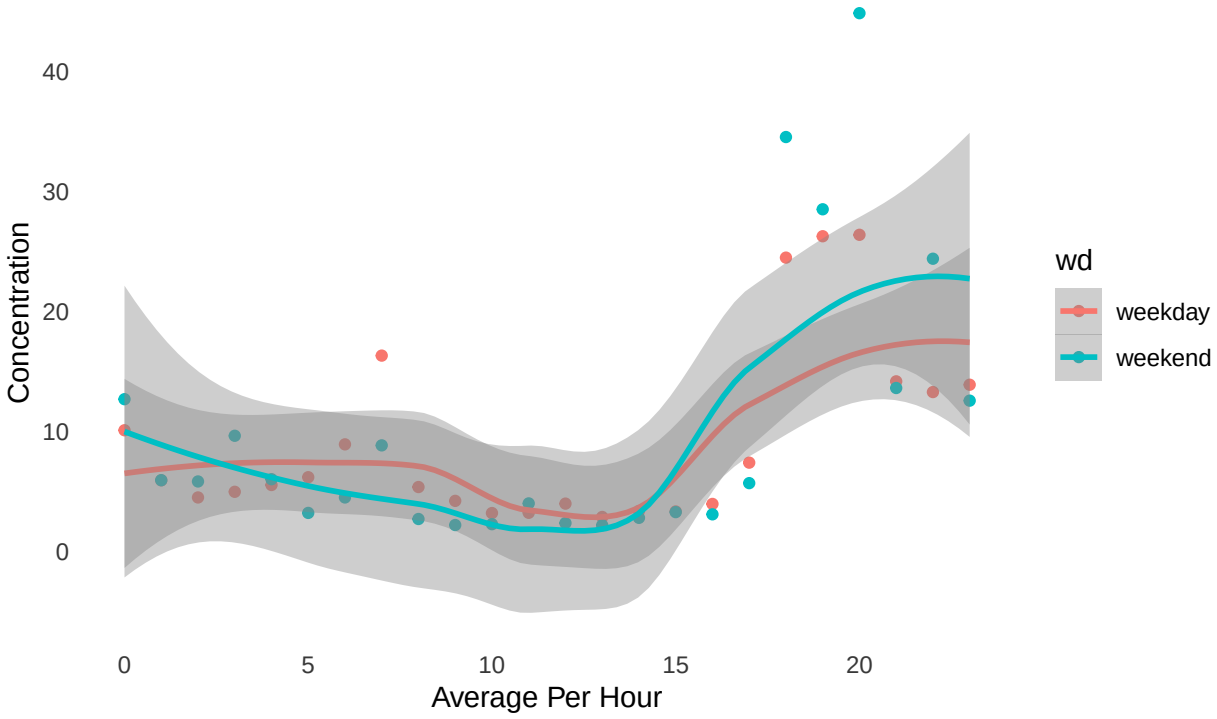
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN397]

September-October 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-09-01	3.3	20.8	100.0	100.0
2022-09-02	1.9	11.3	100.0	100.0
2022-09-03	8.2	100.0	100.0	100.0
2022-09-04	11.1	91.5	95.8	95.8
2022-09-05	8.1	57.3	100.0	100.0
2022-09-06	11.4	117.2	100.0	100.0
2022-09-07	4.9	29.9	100.0	100.0
2022-09-08	17.3	153.9	100.0	100.0
2022-09-09	7.5	60.9	100.0	100.0
2022-09-10	12.7	118.1	95.8	95.8
2022-09-11	8.0	62.5	91.7	91.7
2022-09-12	12.2	95.6	100.0	100.0
2022-09-13	11.8	117.3	95.8	95.8
2022-09-14	6.9	55.4	100.0	100.0
2022-09-15	3.3	21.1	100.0	100.0
2022-09-16	2.1	12.3	100.0	100.0
2022-09-17	10.5	95.4	100.0	100.0
2022-09-18	13.8	157.8	100.0	100.0
2022-09-19	8.8	77.5	100.0	100.0
2022-09-20	5.9	34.4	95.8	95.8
2022-09-21	4.4	27.9	95.8	95.8
2022-09-22	17.5	152.7	95.8	95.8
2022-09-23	13.8	81.2	100.0	100.0
2022-09-24	22.4	175.6	95.8	95.8
2022-09-25	13.2	102.2	95.8	95.8
2022-09-26	4.3	30.9	95.8	95.8
2022-09-27	3.4	23.8	100.0	100.0
2022-09-28	9.6	65.9	87.5	87.5
2022-09-29	8.7	90.3	95.8	95.8
2022-09-30	NA	NA	NA	NA
2022-10-01	NA	NA	NA	NA
2022-10-02	NA	NA	NA	NA
2022-10-03	3.0	8.8	100.0	100.0
2022-10-04	2.7	10.4	100.0	100.0
2022-10-05	3.4	13.4	91.7	91.7
2022-10-06	2.5	12.4	100.0	100.0
2022-10-07	2.4	16.1	100.0	100.0
2022-10-08	2.6	18.2	100.0	100.0
2022-10-09	3.0	30.9	100.0	100.0
2022-10-10	7.1	56.9	100.0	100.0
2022-10-11	3.5	31.8	95.8	95.8
2022-10-12	8.2	51.3	91.7	91.7
2022-10-13	3.5	19.6	95.8	95.8
2022-10-14	2.9	18.9	95.8	95.8
2022-10-15	5.1	37.5	100.0	100.0

(continued)

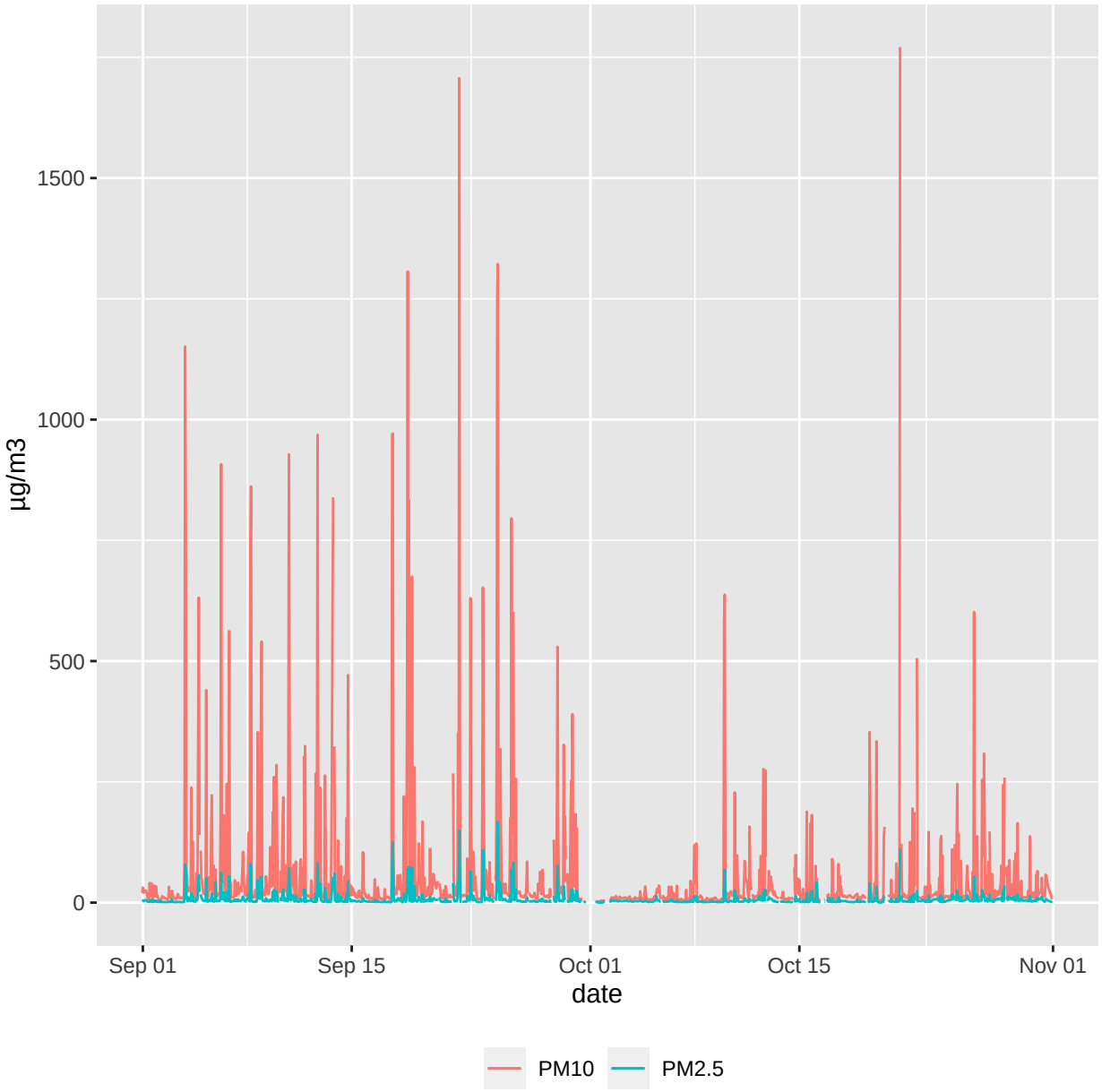
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-10-16	5.2	18.4	79.2	79.2
2022-10-17	3.0	21.0	100.0	100.0
2022-10-18	2.0	12.9	100.0	100.0
2022-10-19	4.6	34.4	91.7	91.7
2022-10-20	6.1	52.2	83.3	83.3
2022-10-21	8.4	102.5	95.8	95.8
2022-10-22	5.1	57.1	91.7	91.7
2022-10-23	3.8	19.3	100.0	100.0
2022-10-24	5.4	28.3	100.0	100.0
2022-10-25	8.3	54.1	95.8	95.8
2022-10-26	8.5	56.4	100.0	100.0
2022-10-27	7.8	69.1	91.7	91.7
2022-10-28	8.7	46.6	95.8	95.8
2022-10-29	7.9	39.2	100.0	100.0
2022-10-30	4.7	23.2	100.0	100.0
2022-10-31	5.1	24.6	91.7	91.7

Monthly Average

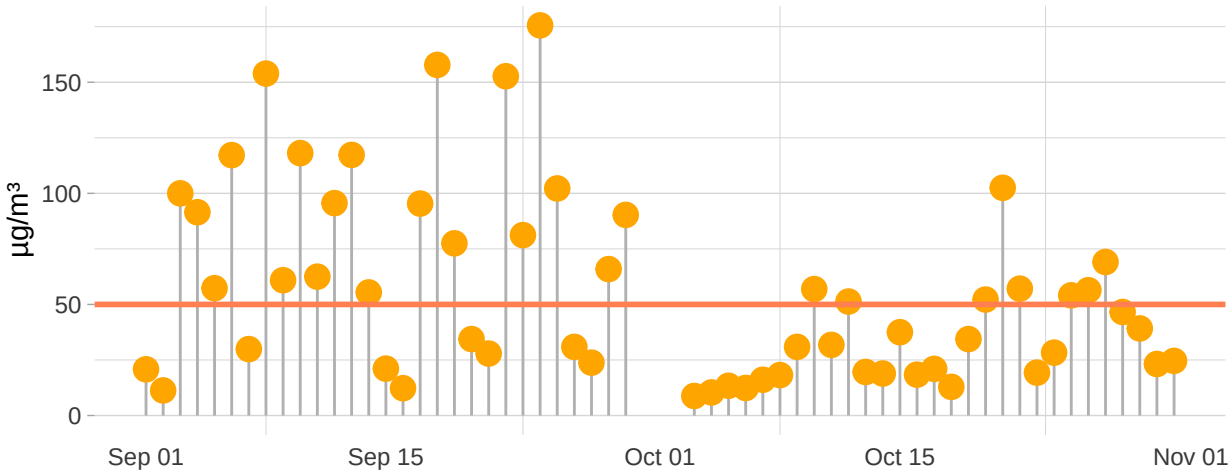
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
September 2022	9.206897	77.26552	97.83448	97.83448
October 2022	4.982759	33.98276	96.12069	96.12069

NA - Not enough data to calculate averages

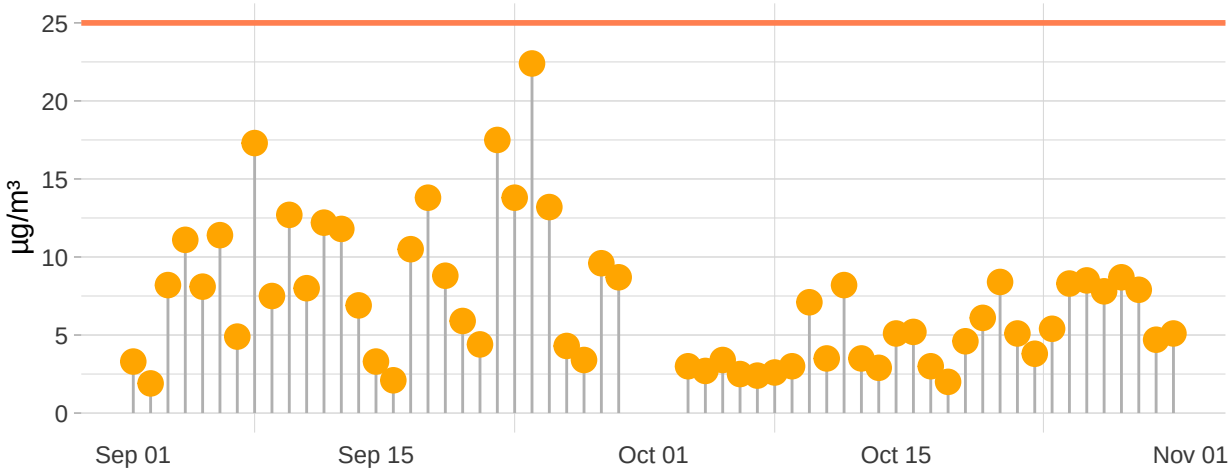
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

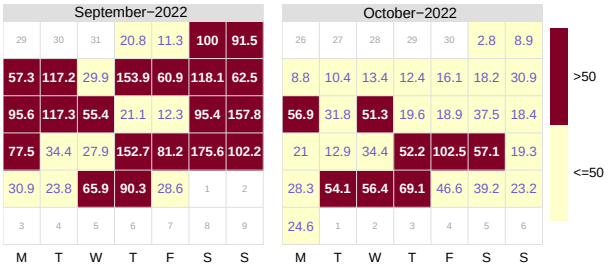


BENNETT RESOURCES

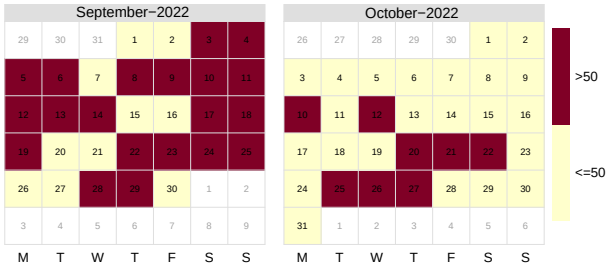
SITE: Ben397
Bi-Monthly Report
September 2022 - October 2022

Daily Exceedances

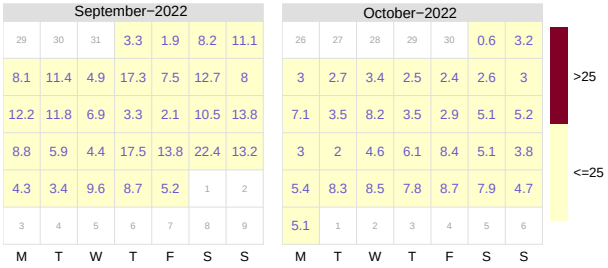
PM$_{10}$. Daily Exceedances at Ben397



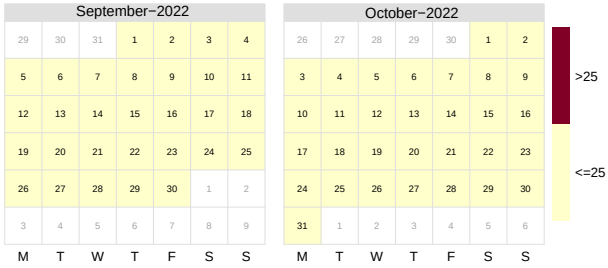
PM$_{10}$. Days with Exceedances at Ben397



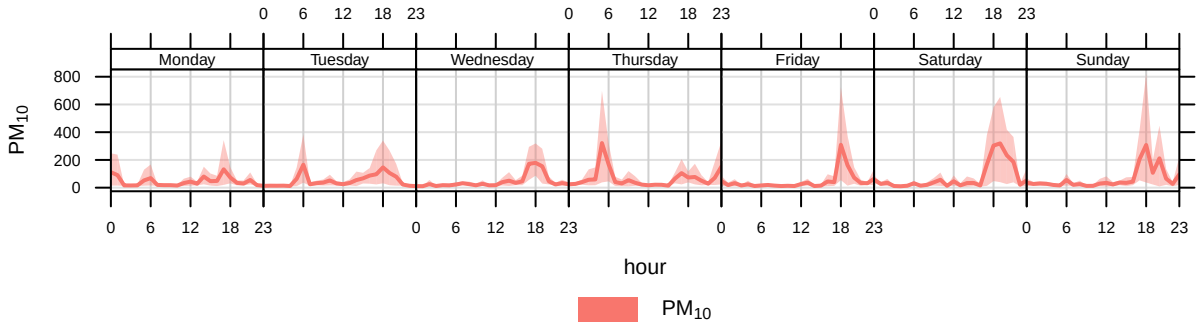
PM$_{2.5}$. Daily Exceedances at Ben397

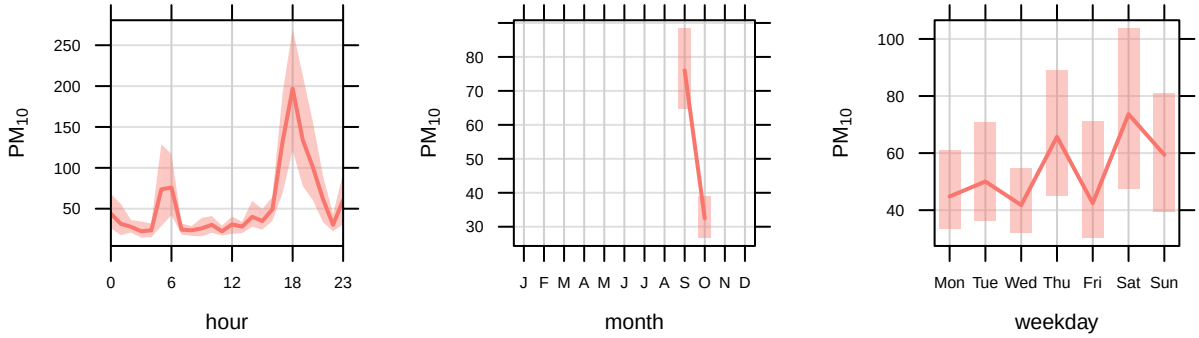


PM$_{2.5}$. Days with Exceedances at Ben397



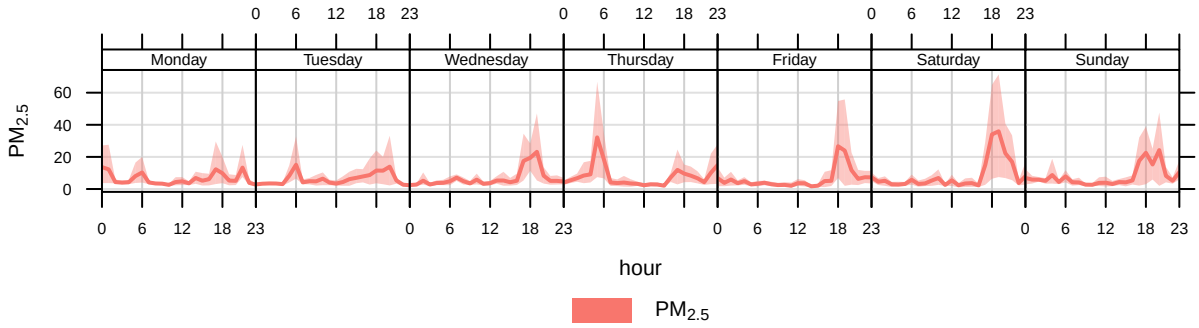
PM_{10} Time variation at Ben397

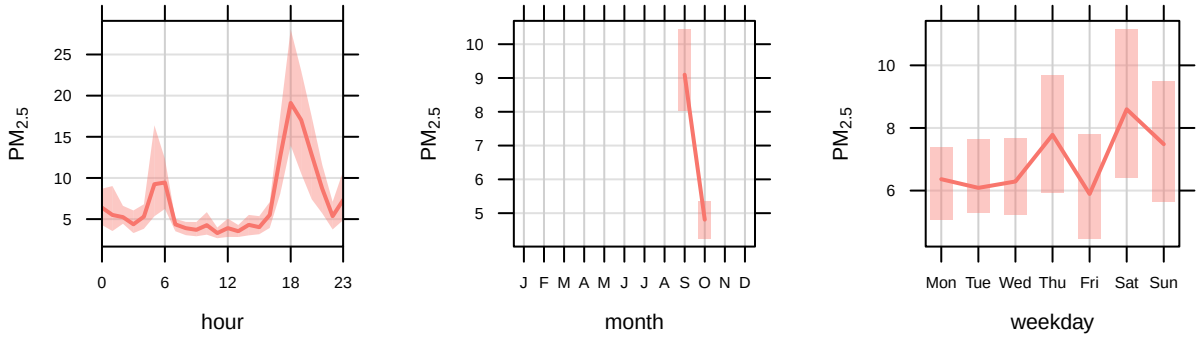




mean and 95% confidence interval in mean

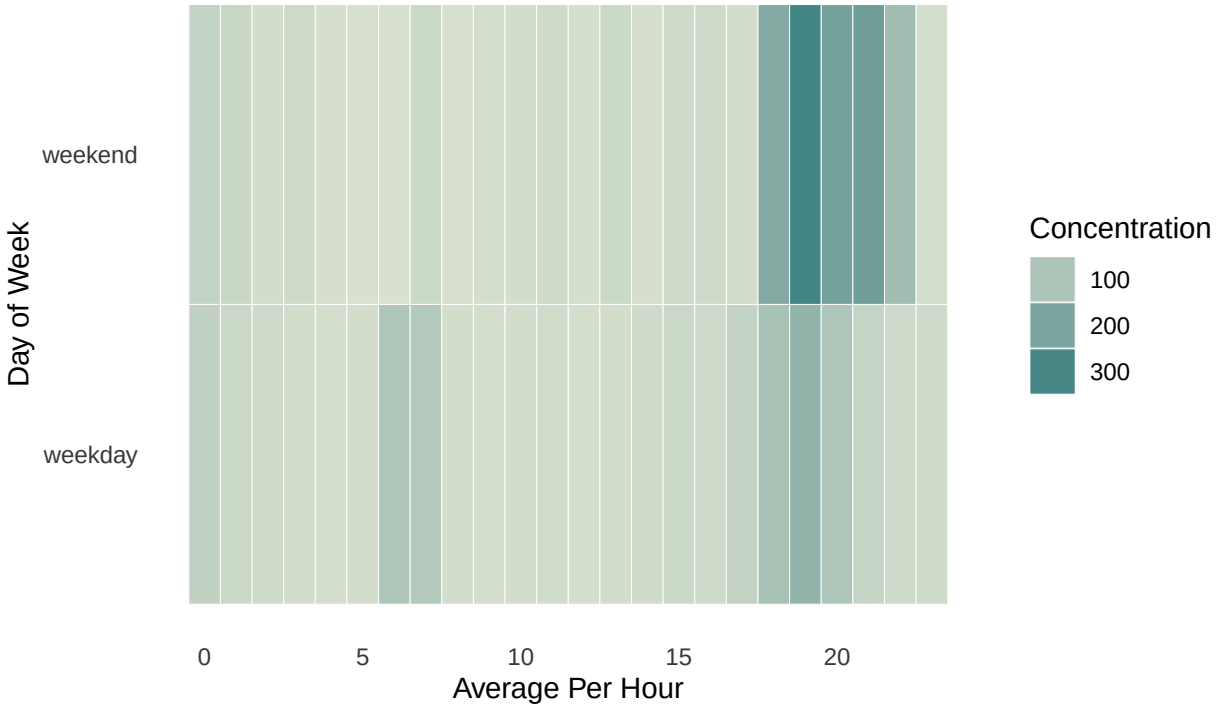
$PM_{2.5}$ Time variation at Ben397



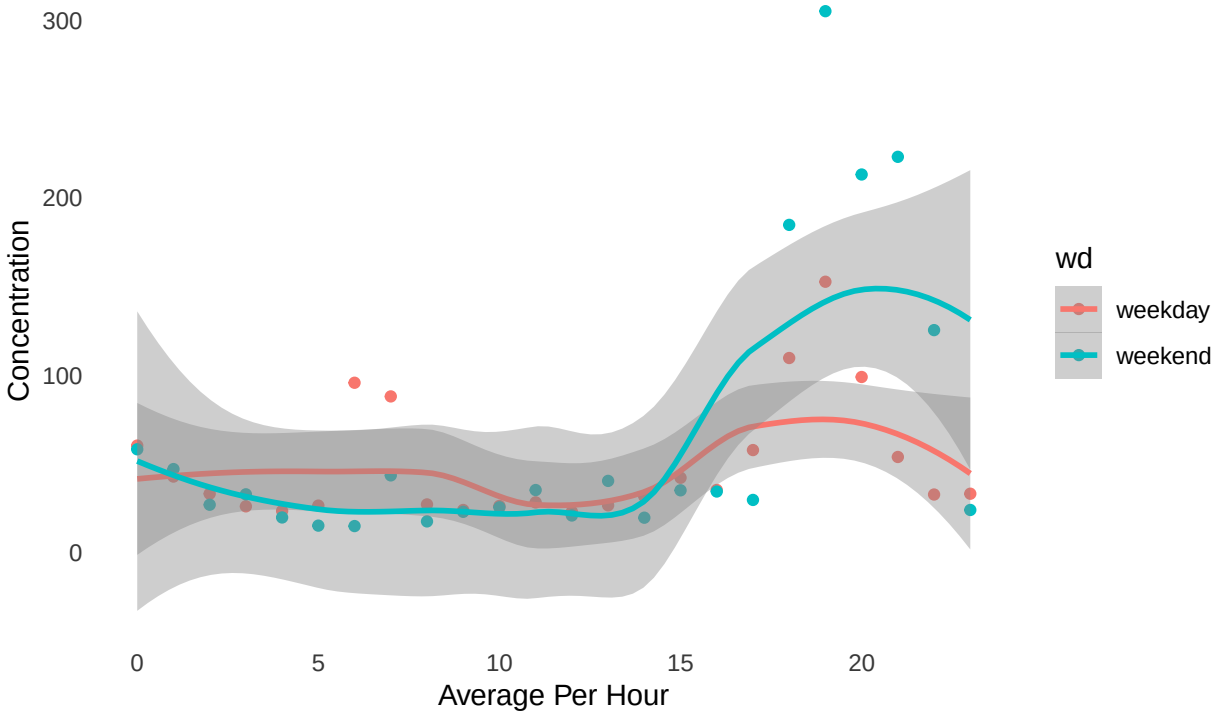


mean and 95% confidence interval in mean

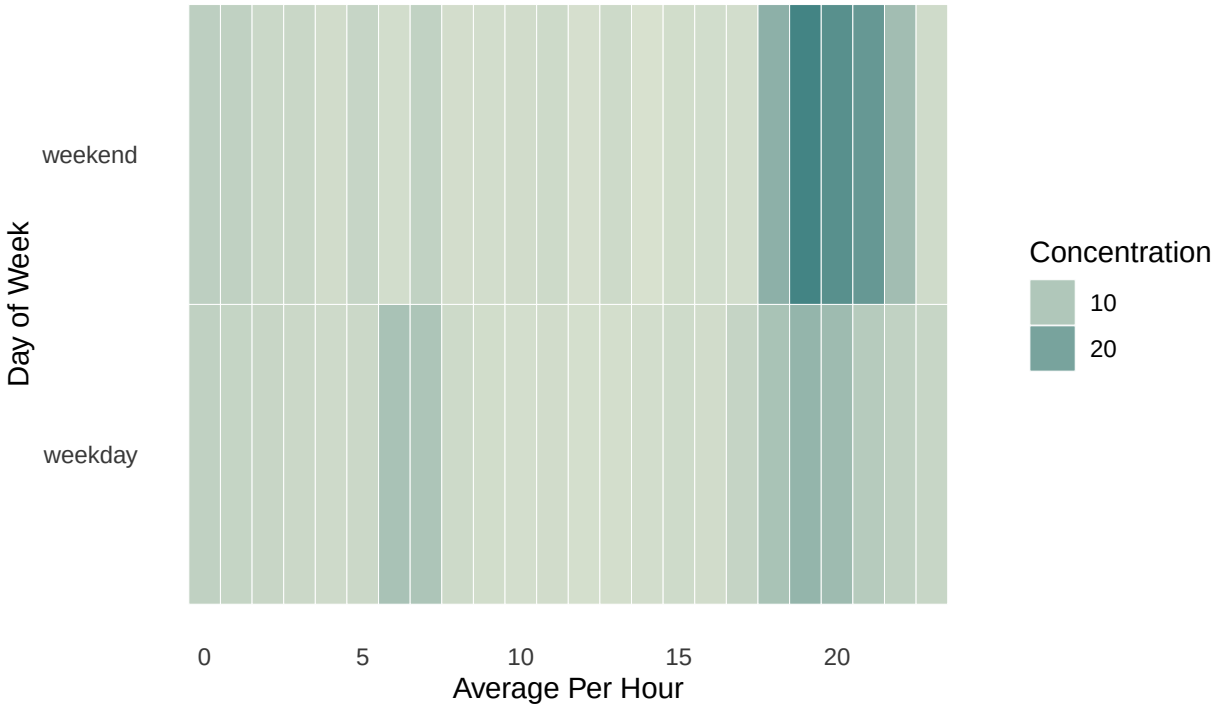
PM10 concentration by Weekday/weekend and Hour



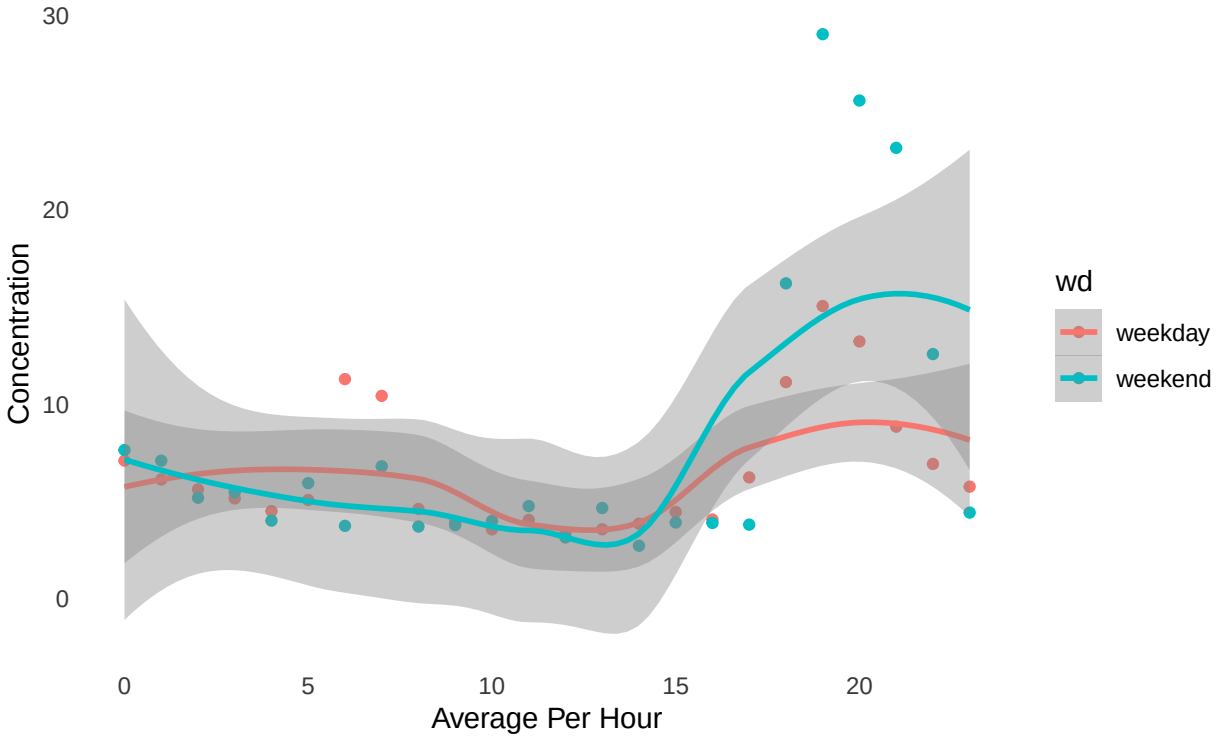
PM10 concentration by weekday and weekend with trend



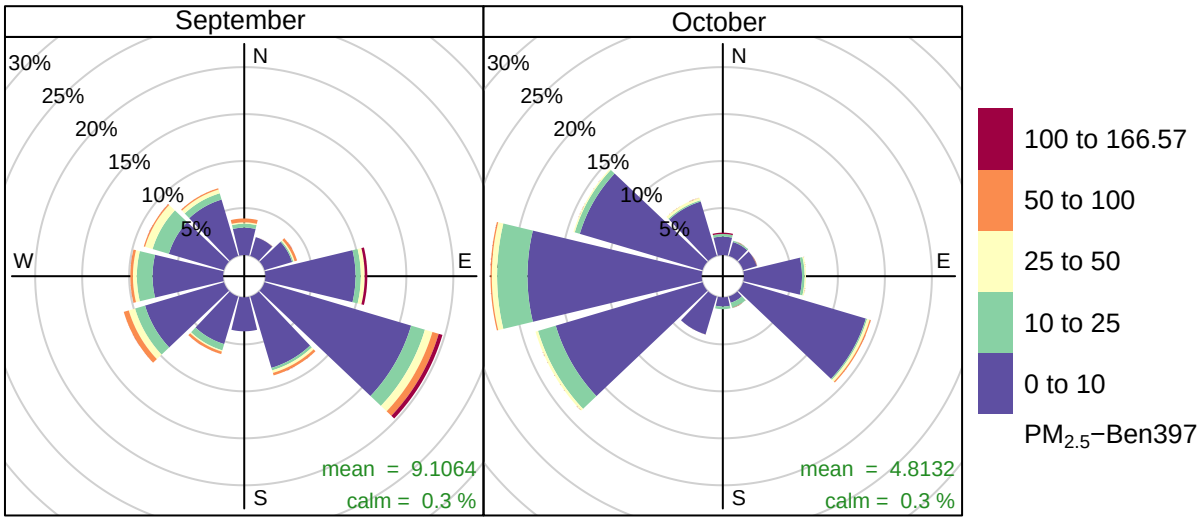
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

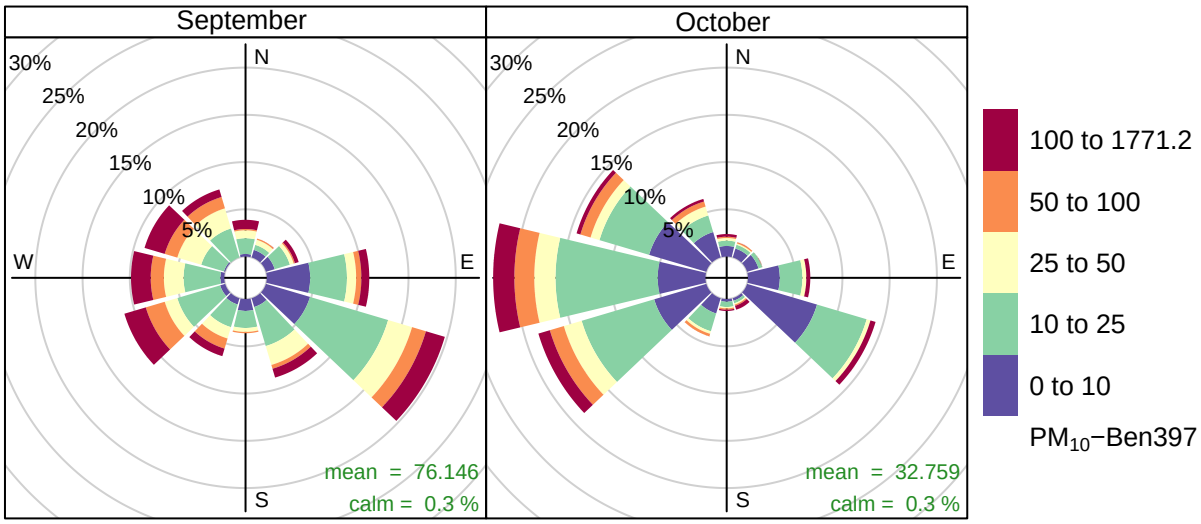


$PM_{2.5}$ pollution rose at Ben397



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben397



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN397]

November 2022

SITE: Ben397
Bi-Monthly Report
November 2022 - November 2022

Daily Averages

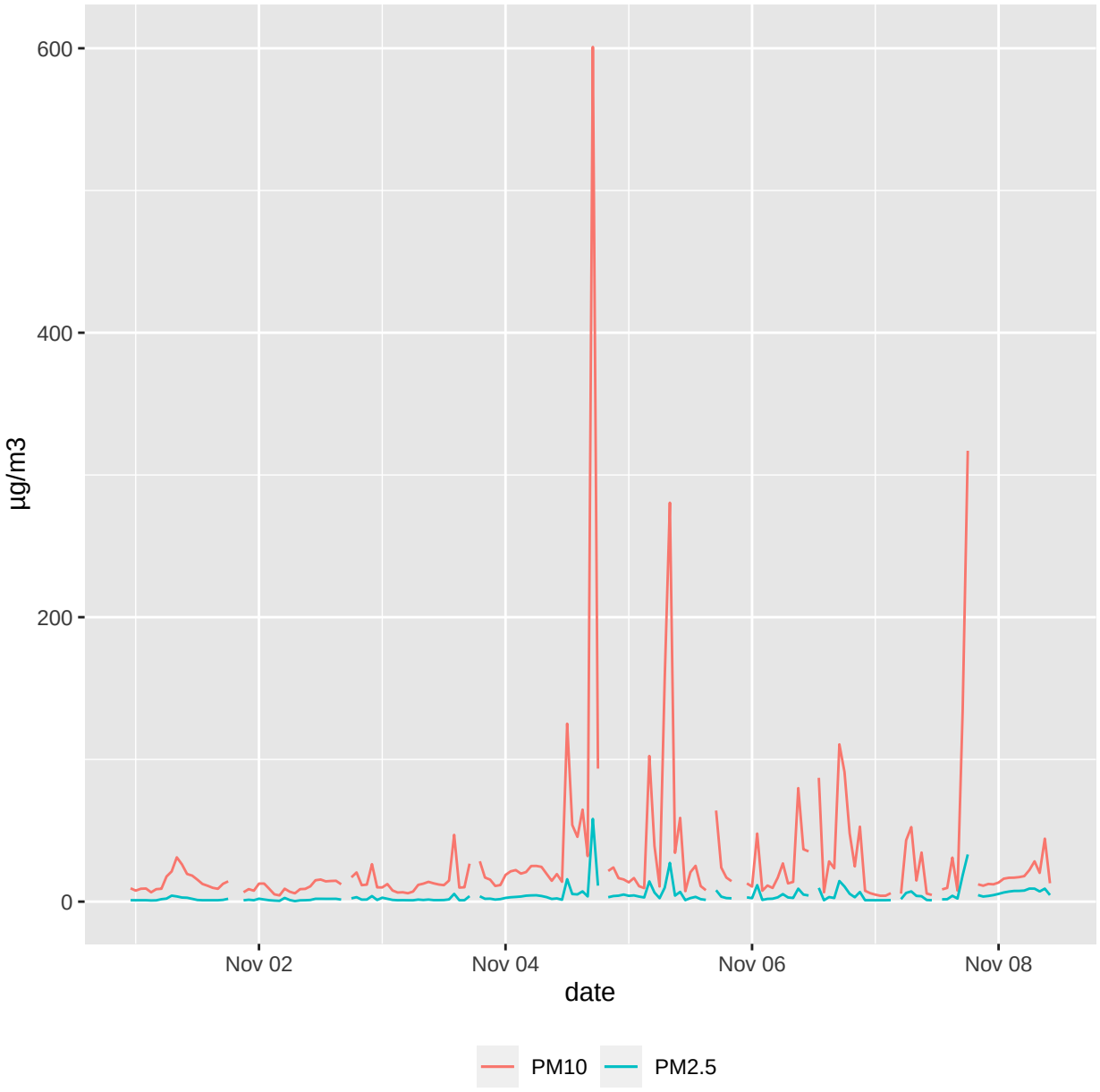
	µg/m³	µg/m³	%	%
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
2022-11-01	1.6	13.3	91.7	91.7
2022-11-02	1.6	12.1	95.8	95.8
2022-11-03	1.8	14.0	95.8	95.8
2022-11-04	7.0	58.2	95.8	95.8
2022-11-05	5.5	44.7	87.5	87.5
2022-11-06	4.8	34.6	95.8	95.8
2022-11-07	5.1	35.1	87.5	87.5
2022-11-08	NA	NA	45.8	45.8

Monthly Average

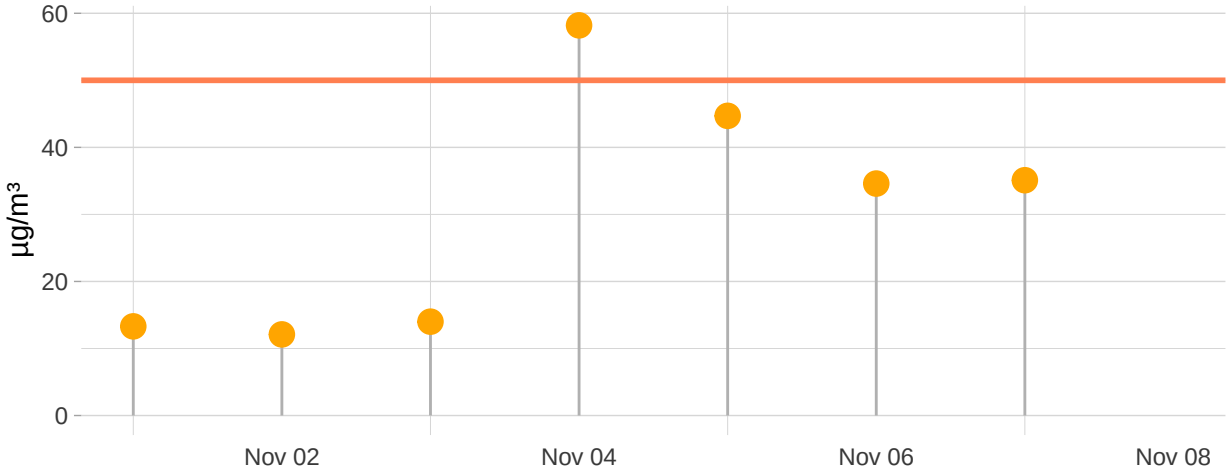
	PM2.5-Ben397	PM10-Ben397	PM2.5 data capture-Ben397	PM10 data capture-Ben397
November 2022	NA	NA	NA	NA

NA - Not enough data to calculate averages

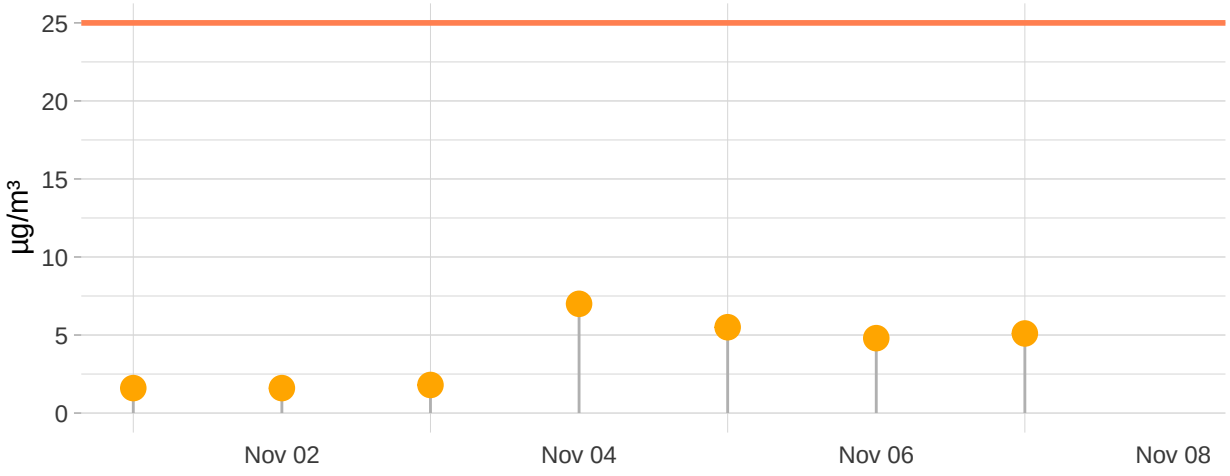
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

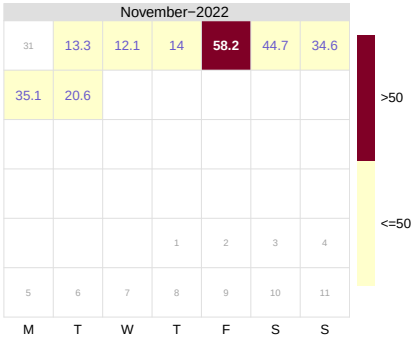


BENNETT RESOURCES

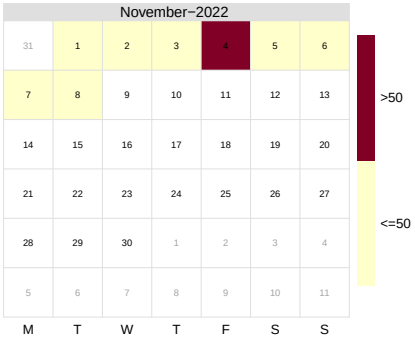
SITE: Ben397
Bi-Monthly Report
November 2022 - November 2022

Daily Exceedances

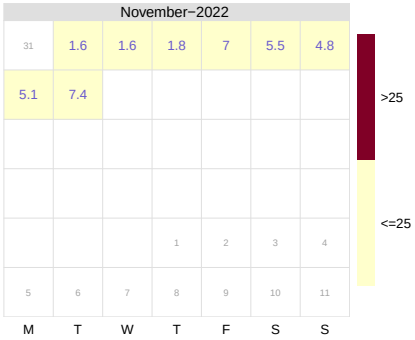
PM_{10}. Daily Exceedances at Ben397



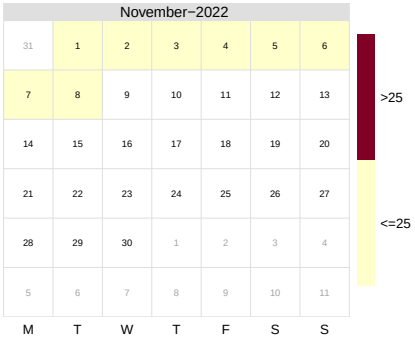
PM_{10}. Days with Exceedances at Ben397



$PM_{2.5}$. Daily Exceedances at Ben397



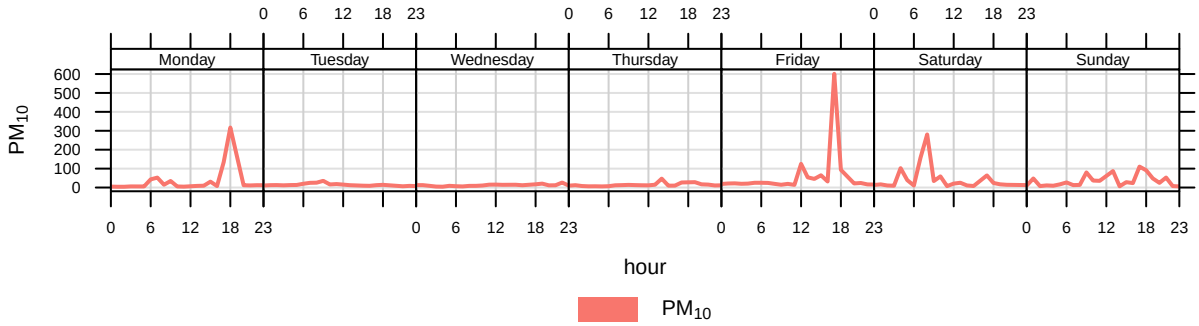
$PM_{2.5}$. Days with Exceedances at Ben397

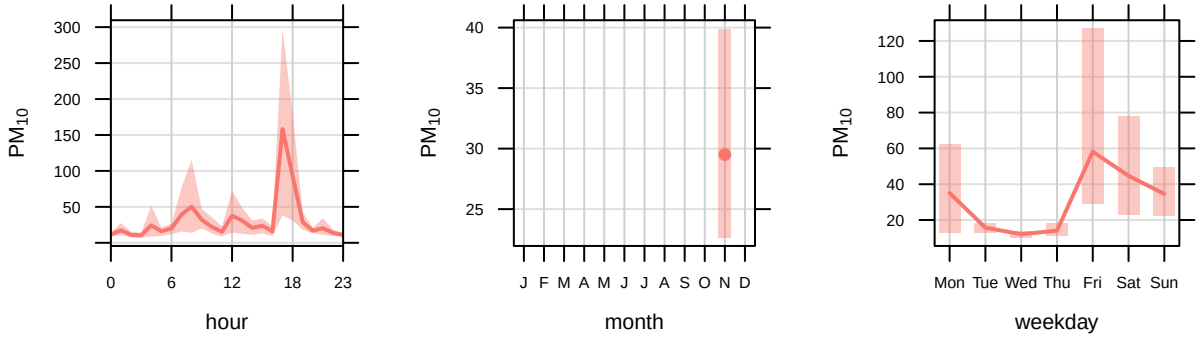


BENNETT RESOURCES

SITE: Ben397
Bi-Monthly Report
November 2022 - November 2022

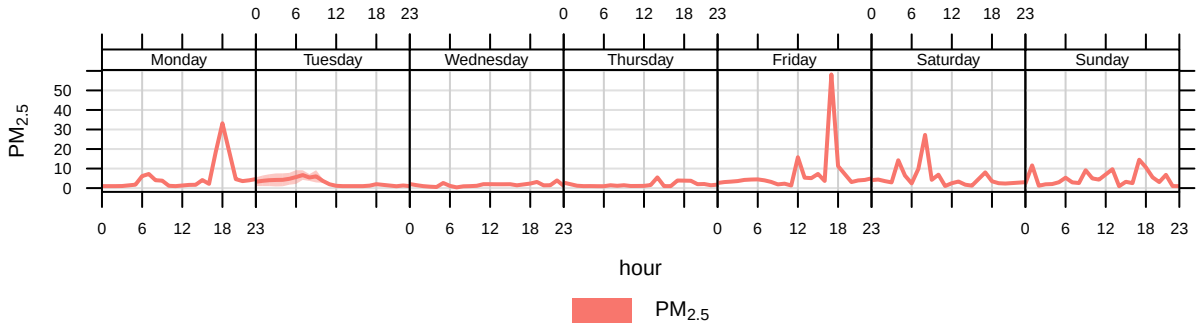
PM_{10} Time variation at Ben397

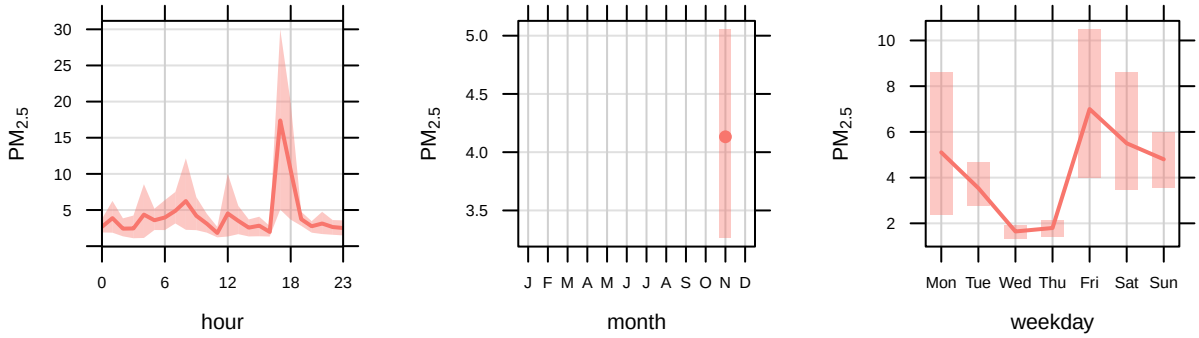




mean and 95% confidence interval in mean

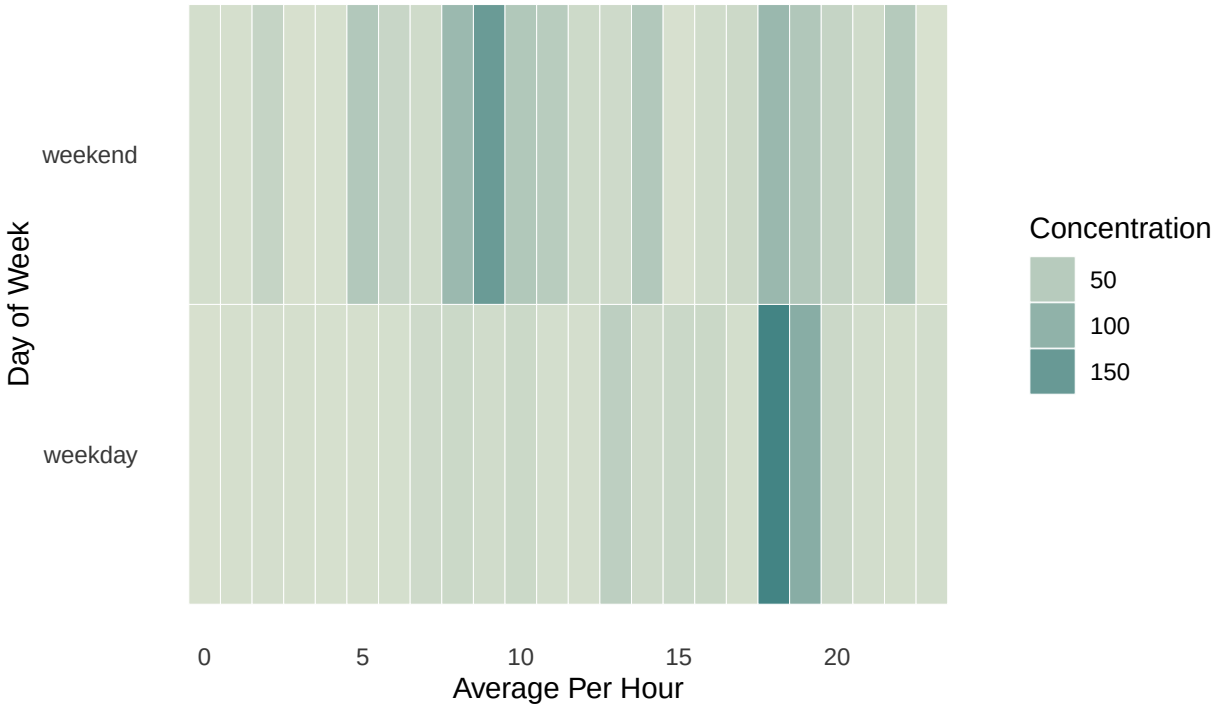
$PM_{2.5}$ Time variation at Ben397



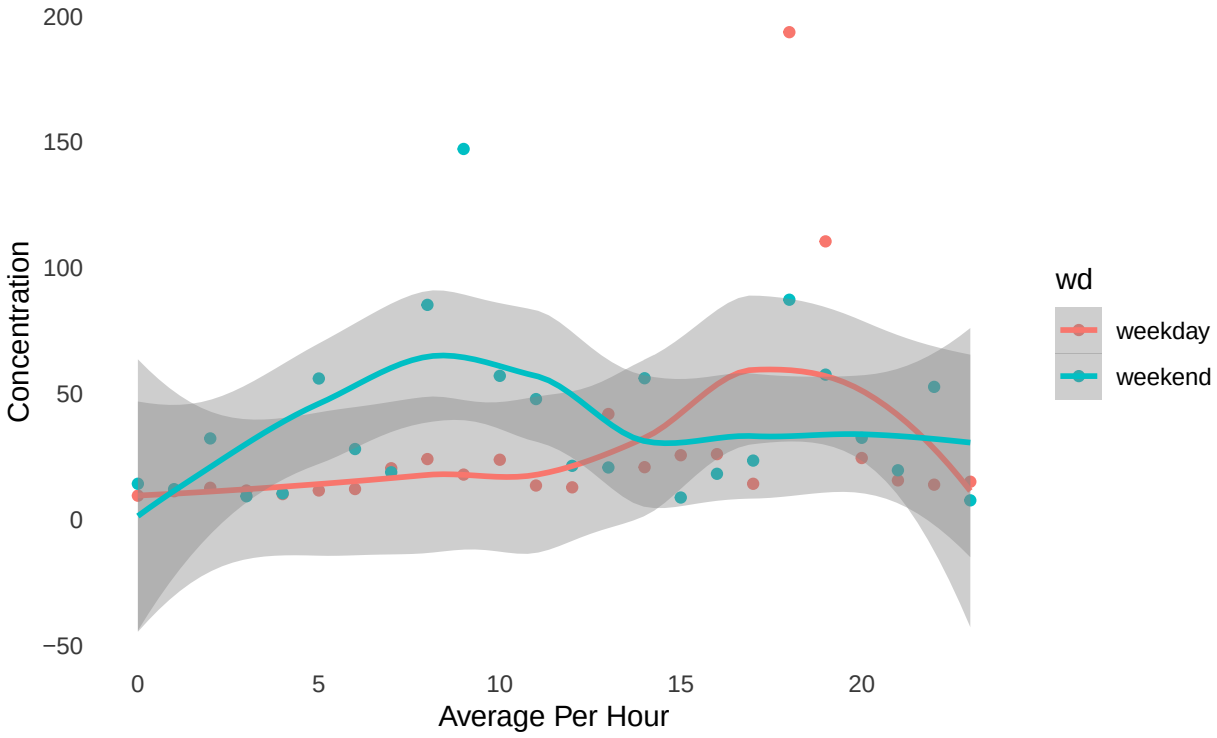


mean and 95% confidence interval in mean

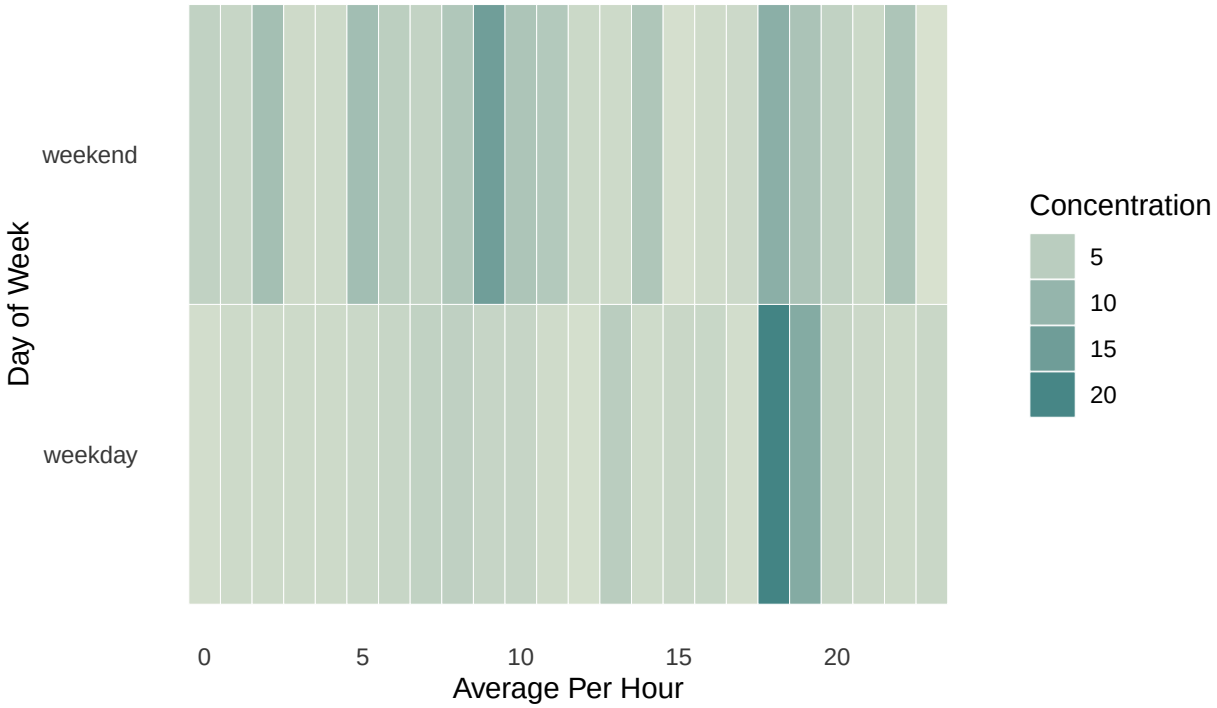
PM10 concentration by Weekday/weekend and Hour



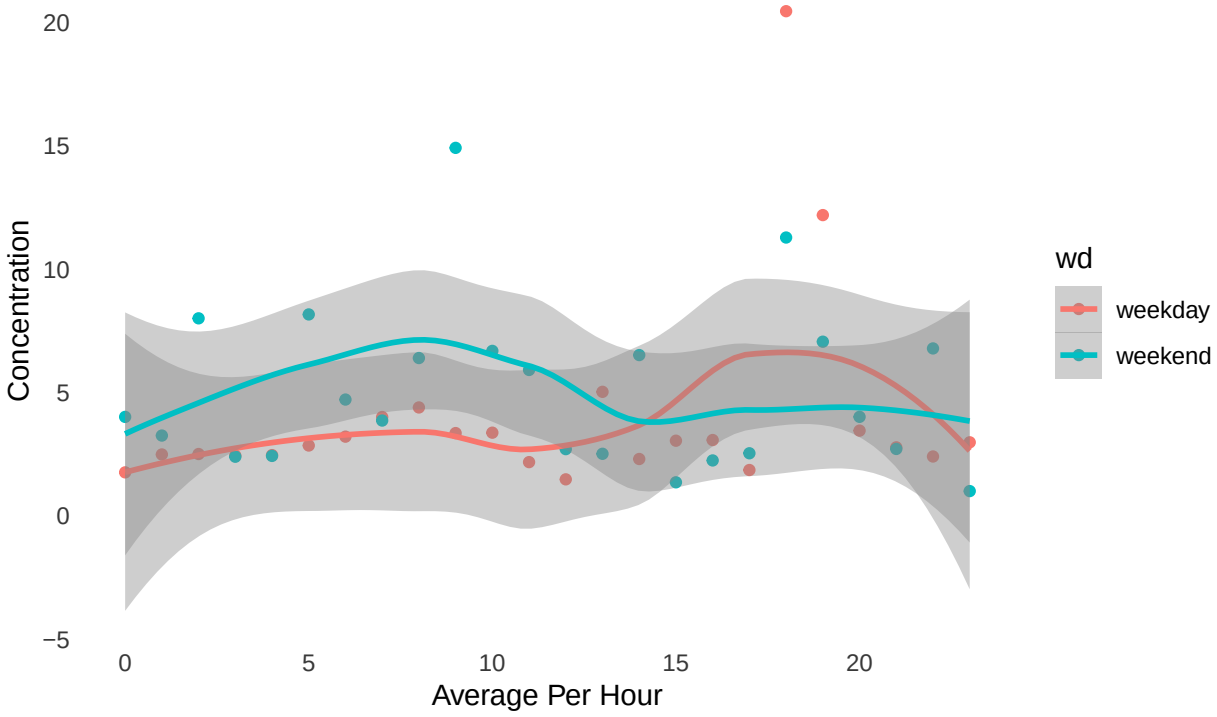
PM10 concentration by weekday and weekend with trend



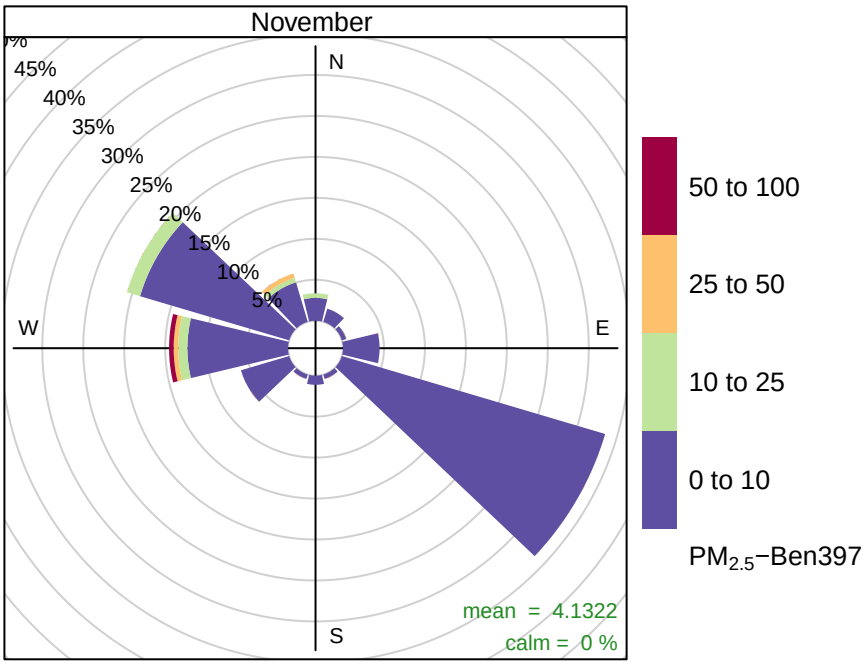
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

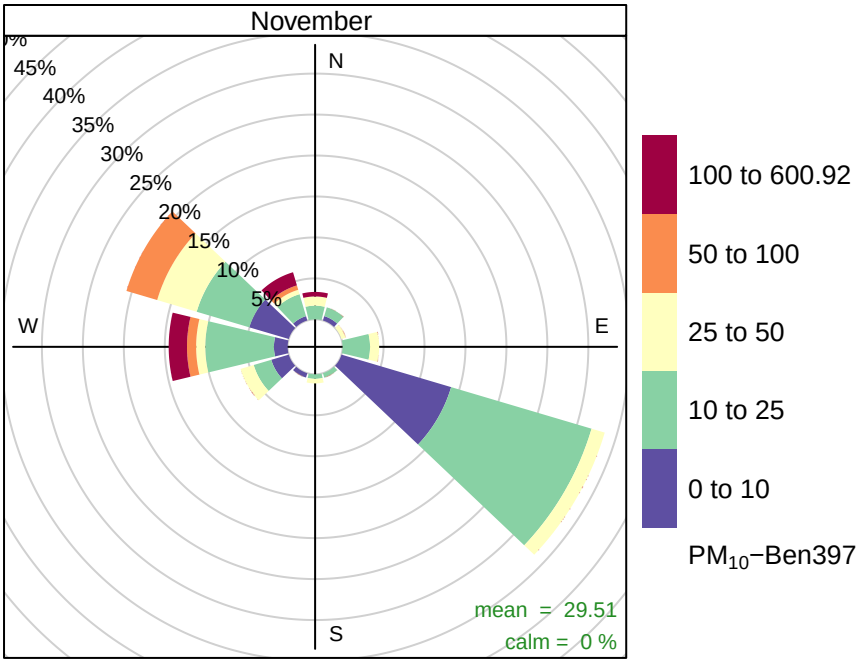


$PM_{2.5}$ pollution rose at Ben397



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben397



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN398]

May-June 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
May 2022 - June 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-05-02	NA	NA	41.7	41.7
2022-05-03	2.6	8.4	100.0	100.0
2022-05-04	2.3	12.7	95.8	95.8
2022-05-05	2.2	12.6	100.0	100.0
2022-05-06	5.1	24.7	100.0	100.0
2022-05-07	4.4	9.7	100.0	100.0
2022-05-08	3.0	7.8	100.0	100.0
2022-05-09	3.9	9.1	100.0	100.0
2022-05-10	8.9	15.1	100.0	100.0
2022-05-11	6.9	11.2	100.0	100.0
2022-05-12	9.1	15.3	100.0	100.0
2022-05-13	4.0	8.3	100.0	100.0
2022-05-14	4.1	8.9	100.0	100.0
2022-05-15	4.3	9.9	100.0	100.0
2022-05-16	3.5	9.2	100.0	100.0
2022-05-17	3.6	15.6	100.0	100.0
2022-05-18	2.8	11.3	100.0	100.0
2022-05-19	4.5	16.7	100.0	100.0
2022-05-20	3.1	13.2	100.0	100.0
2022-05-21	2.2	6.6	100.0	100.0
2022-05-22	3.2	8.8	91.7	91.7
2022-05-23	4.7	12.9	100.0	100.0
2022-05-24	7.5	13.0	100.0	100.0
2022-05-25	5.0	11.8	100.0	100.0
2022-05-26	3.8	10.8	100.0	100.0
2022-05-27	6.3	12.3	100.0	100.0
2022-05-28	6.8	13.3	100.0	100.0
2022-05-29	6.2	13.7	95.8	95.8
2022-05-30	6.0	12.8	100.0	100.0
2022-05-31	10.0	18.1	100.0	100.0
2022-06-01	2.4	4.3	100.0	100.0
2022-06-02	2.1	4.1	100.0	100.0
2022-06-03	4.1	5.6	100.0	100.0
2022-06-04	4.2	5.9	100.0	100.0
2022-06-05	2.6	5.1	100.0	100.0
2022-06-06	3.4	6.3	100.0	100.0
2022-06-07	4.1	6.7	100.0	100.0
2022-06-08	5.9	11.6	100.0	100.0
2022-06-09	5.4	11.5	100.0	100.0
2022-06-10	5.0	9.4	100.0	100.0
2022-06-11	8.8	13.3	100.0	100.0
2022-06-12	11.5	15.7	100.0	100.0
2022-06-13	13.0	18.9	100.0	100.0
2022-06-14	10.7	15.5	100.0	100.0
2022-06-15	10.4	14.3	100.0	100.0

(continued)

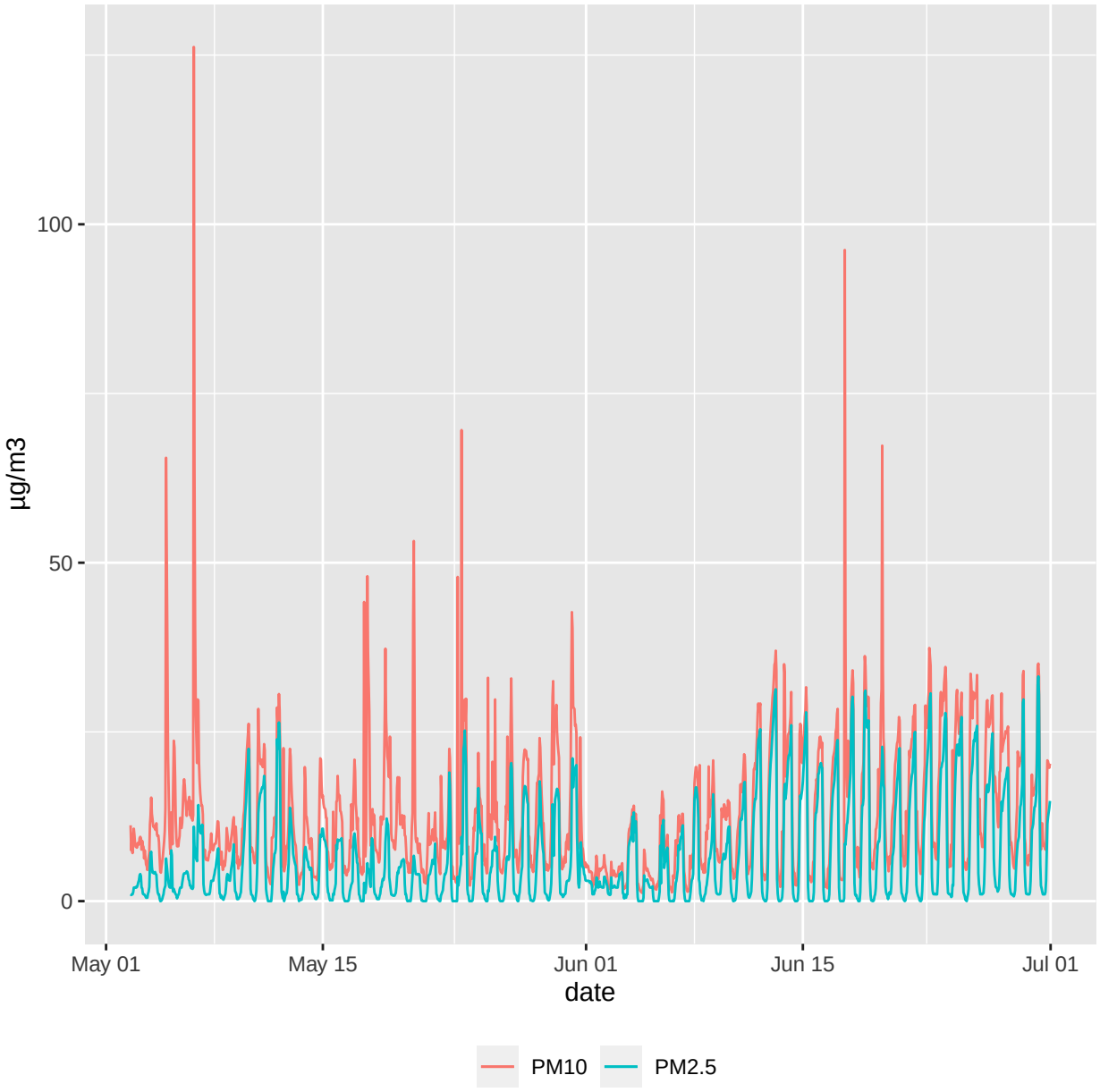
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-06-16	9.1	12.8	100.0	100.0
2022-06-17	9.9	19.1	100.0	100.0
2022-06-18	11.3	16.0	100.0	100.0
2022-06-19	10.8	16.1	95.8	95.8
2022-06-20	8.1	16.7	100.0	100.0
2022-06-21	9.1	15.5	100.0	100.0
2022-06-22	9.9	16.8	100.0	100.0
2022-06-23	12.3	19.8	100.0	100.0
2022-06-24	12.6	19.6	100.0	100.0
2022-06-25	11.9	18.0	100.0	100.0
2022-06-26	12.0	20.4	100.0	100.0
2022-06-27	11.0	21.6	100.0	100.0
2022-06-28	8.3	15.3	100.0	100.0
2022-06-29	9.5	14.8	100.0	100.0
2022-06-30	11.2	17.0	100.0	100.0

Monthly Average

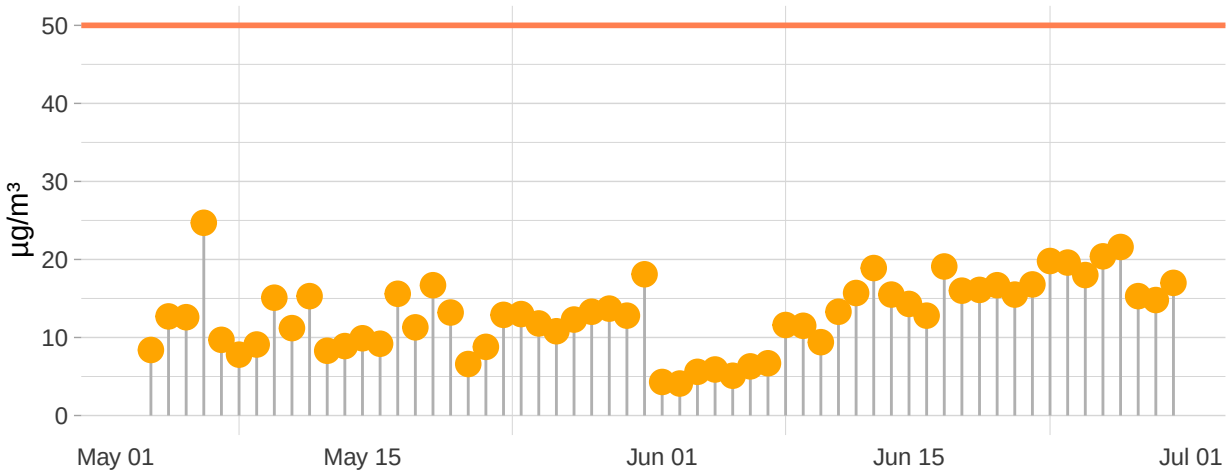
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
May 2022	4.827586	12.20	97.50	97.50
June 2022	8.353333	13.59	99.86	99.86

NA - Not enough data to calculate averages

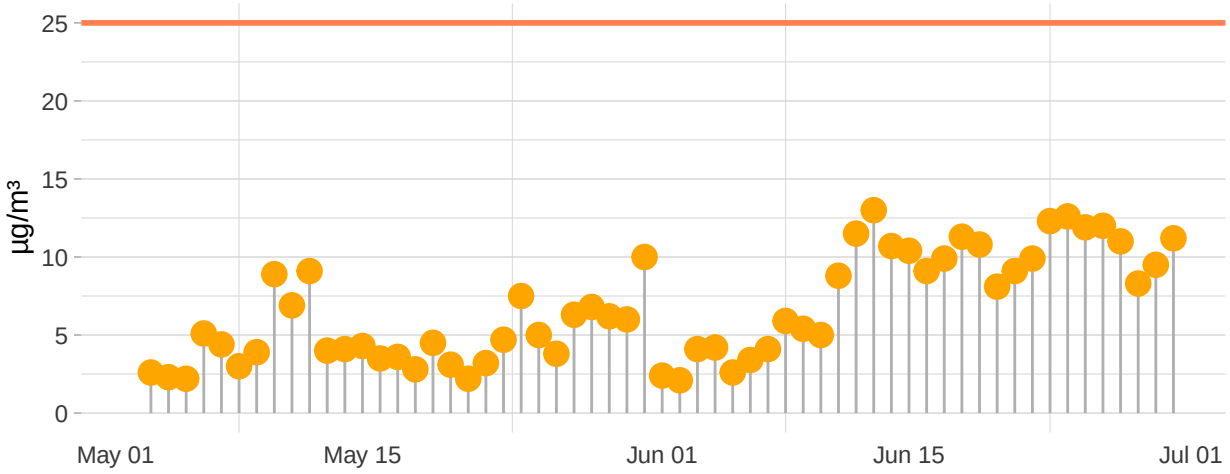
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages



BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
May 2022 - June 2022

Daily Exceedances

PM_{10}. Daily Exceedances at Ben398

May−2022						
25	26	27	28	29	30	
8.9	8.4	12.7	12.6	24.7	9.7	7.8
9.1	15.1	11.2	15.3	8.3	8.9	9.9
9.2	15.6	11.3	16.7	13.2	6.6	8.8
12.9	13	11.8	10.8	12.3	13.3	13.7
12.8	18.1	1	2	3	4	5
M	T	W	T	F	S	S

June−2022						
30	31	4.3	4	5.6	5.9	5.1
6.3	6.7	11.6	11.5	9.4	13.3	15.7
18.9	15.5	14.3	12.8	19.1	16	16.1
16.7	15.5	16.8	19.8	19.6	18	20.4
21.6	15.3	14.8	17	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

>50
<=50

PM_{10}. Days with Exceedances at Ben398

May−2022						
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5
M	T	W	T	F	S	S

June−2022						
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

>50
<=50

$PM_{2.5}$. Daily Exceedances at Ben398

May−2022						
25	26	27	28	29	30	
1.5	2.6	2.3	2.2	5.1	4.4	3
3.9	8.9	6.9	9.1	4	4.1	4.3
3.5	3.6	2.8	4.5	3.1	2.2	3.2
4.7	7.5	5	3.8	6.3	6.8	6.2
6	10	1	2	3	4	5
M	T	W	T	F	S	S

June−2022						
30	31	2.4	2.1	4.1	4.2	2.6
3.4	4	5.9	5.4	5	8.8	11.5
13	10.7	10.4	9.1	9.9	11.3	10.8
8.1	9.1	9.9	12.3	12.6	11.9	11.9
11	8.3	9.5	11.2	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

>25
<=25

$PM_{2.5}$. Days with Exceedances at Ben398

May−2022						
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5
M	T	W	T	F	S	S

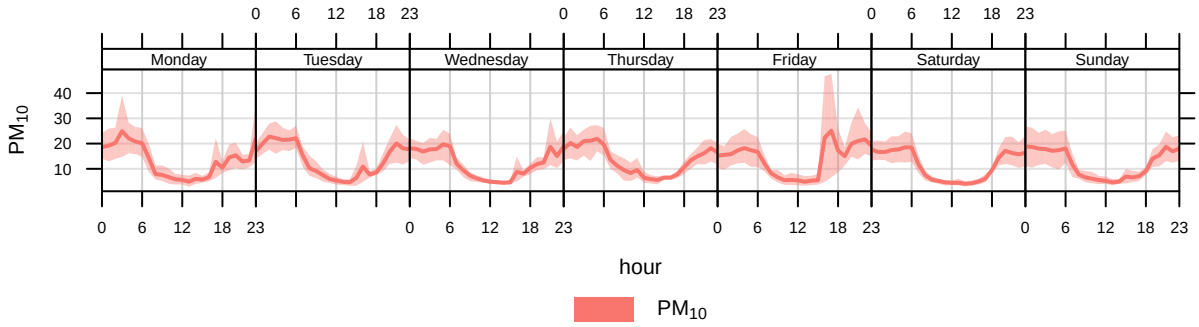
June−2022						
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10
M	T	W	T	F	S	S

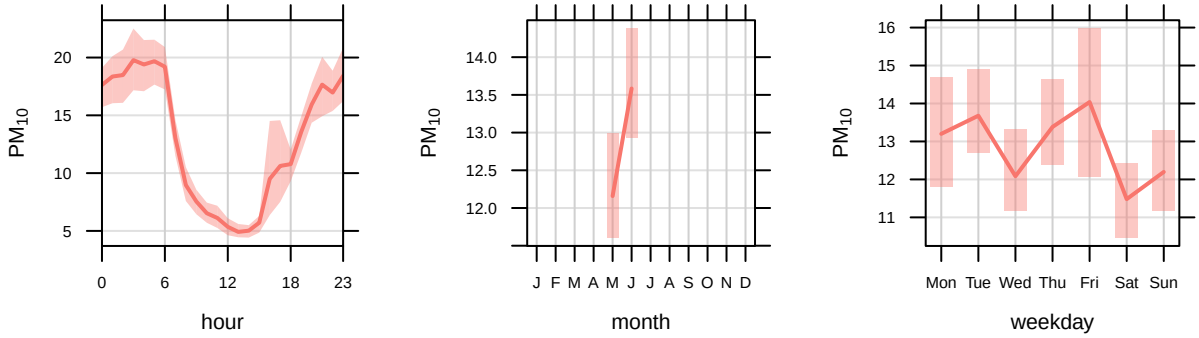
>25
<=25

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
May 2022 - June 2022

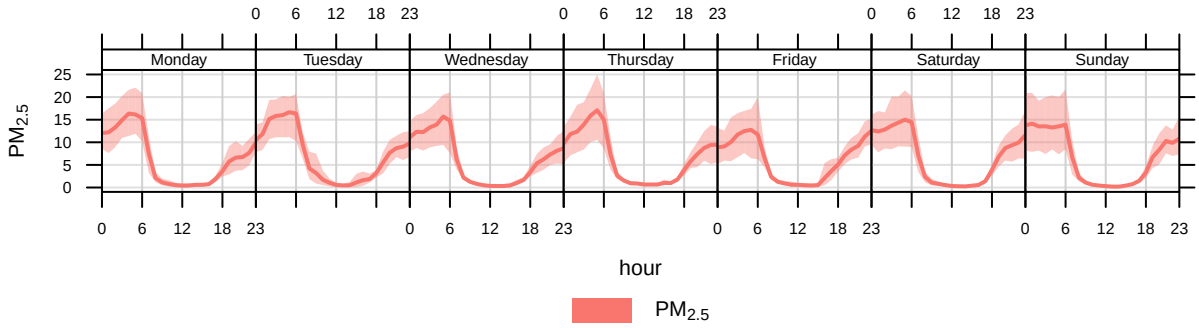
PM_{10} Time variation at Ben398

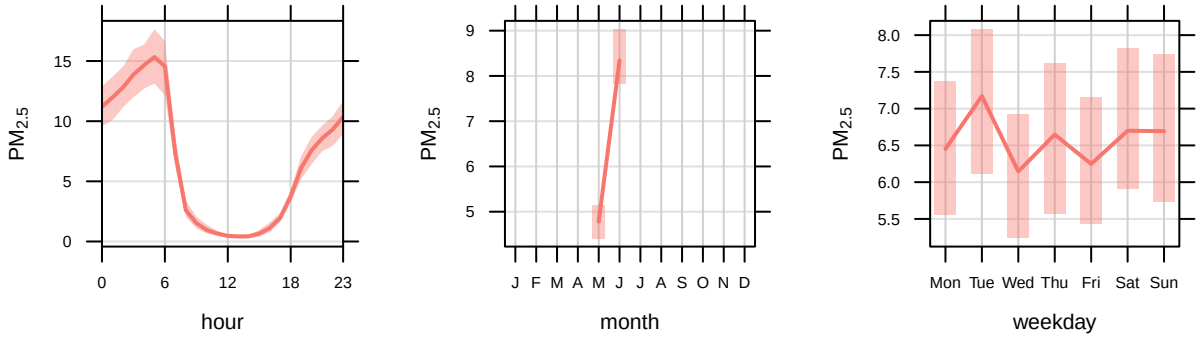




mean and 95% confidence interval in mean

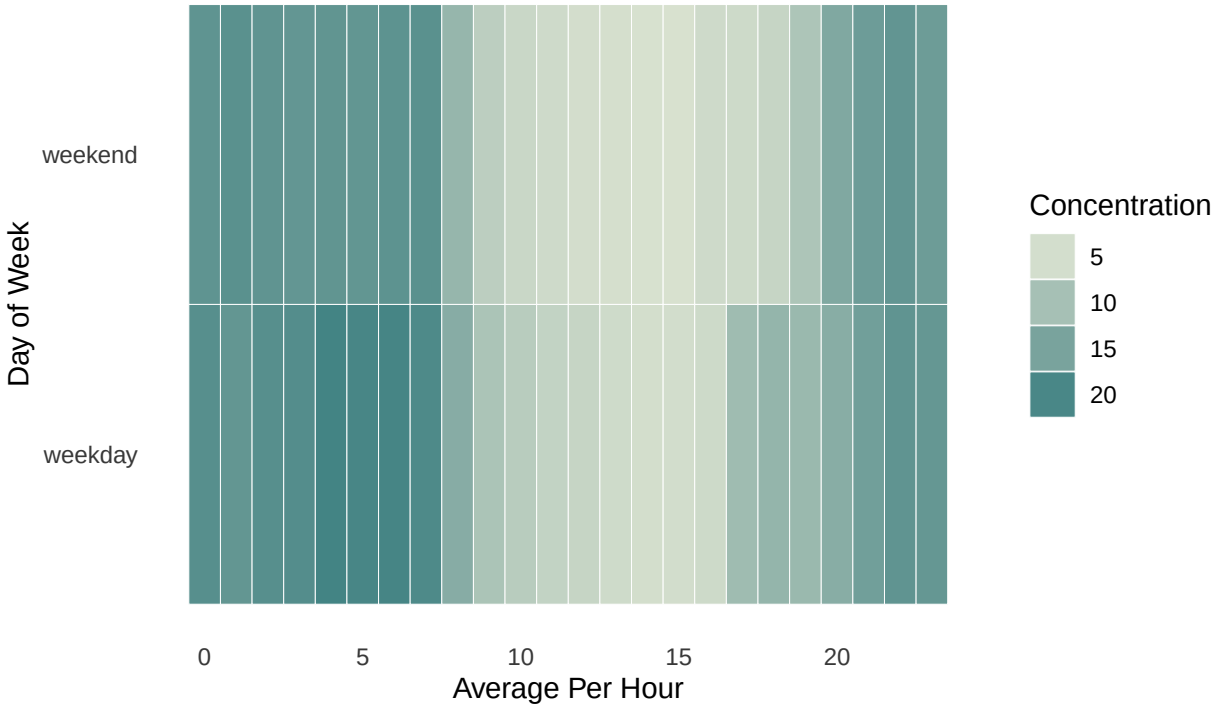
$PM_{2.5}$ Time variation at Ben398



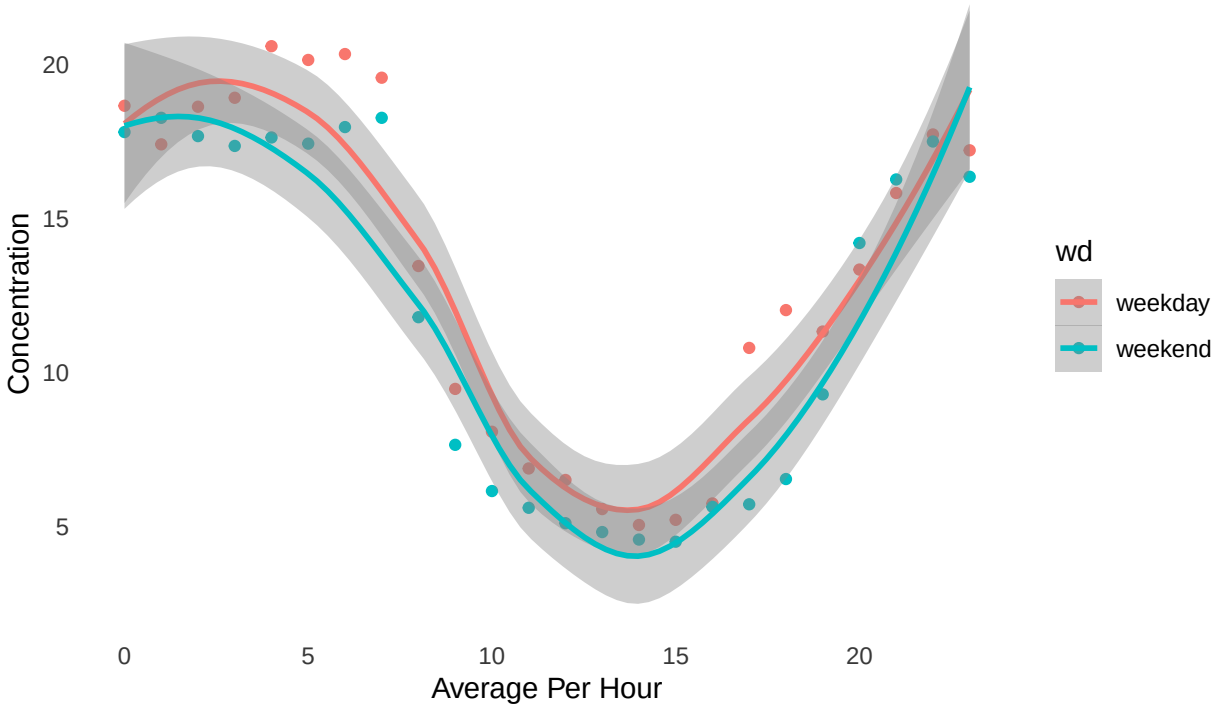


mean and 95% confidence interval in mean

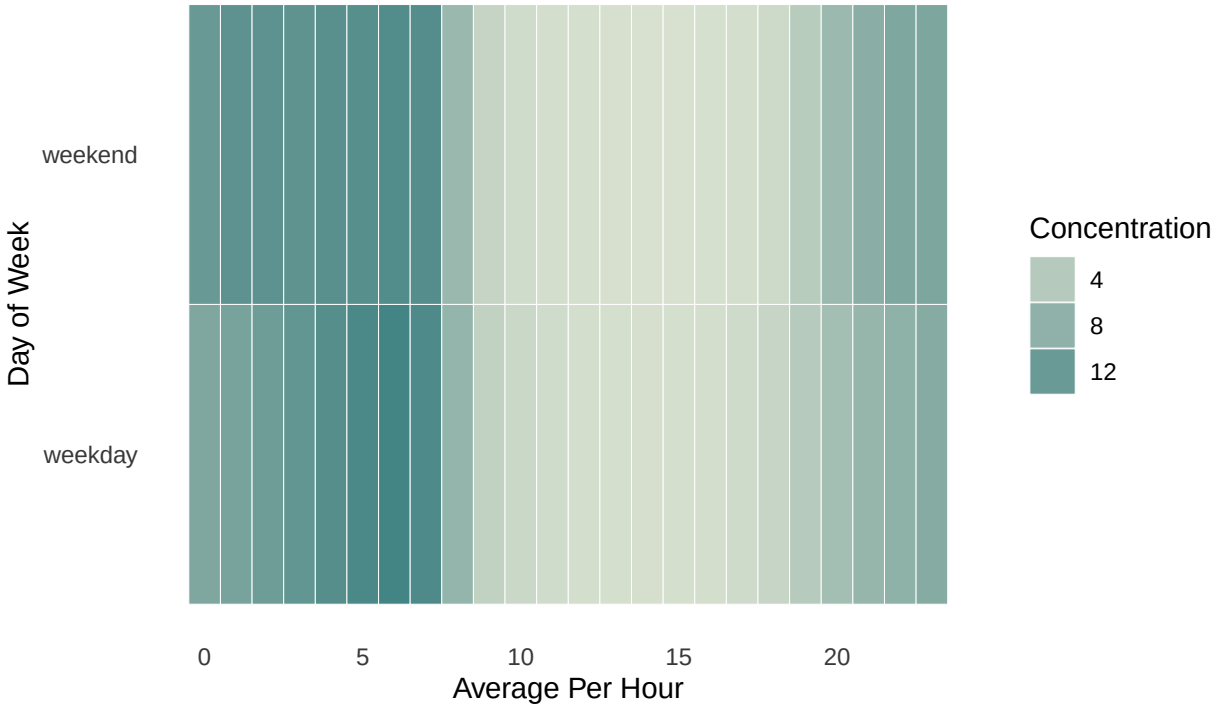
PM10 concentration by Weekday/weekend and Hour



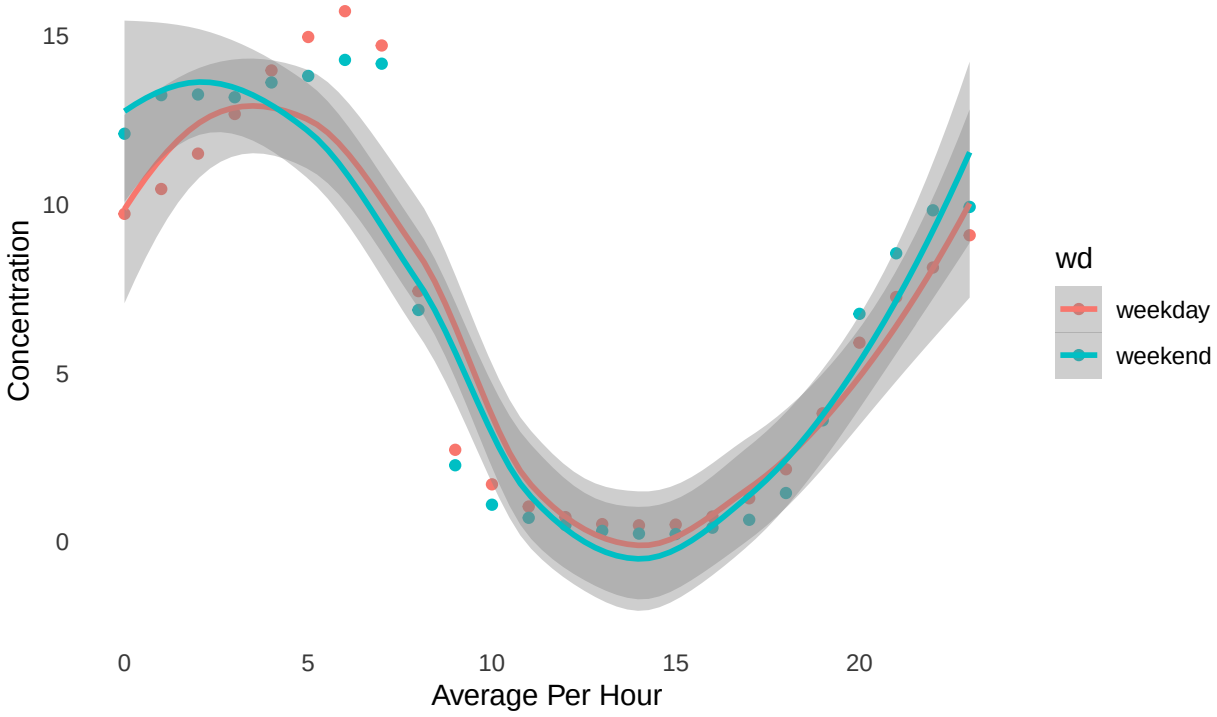
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN398]

July-August 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
July 2022 - August 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-07-01	12.0	19.8	100.0	100.0
2022-07-02	13.7	21.5	100.0	100.0
2022-07-03	16.2	24.7	100.0	100.0
2022-07-04	23.3	30.0	100.0	100.0
2022-07-05	25.7	33.3	100.0	100.0
2022-07-06	22.1	26.0	100.0	100.0
2022-07-07	18.8	22.9	100.0	100.0
2022-07-08	20.6	25.5	100.0	100.0
2022-07-09	21.2	25.9	100.0	100.0
2022-07-10	19.2	24.6	100.0	100.0
2022-07-11	20.5	25.6	100.0	100.0
2022-07-12	21.0	26.6	95.8	95.8
2022-07-13	21.1	26.7	95.8	95.8
2022-07-14	20.5	26.3	100.0	100.0
2022-07-15	20.4	27.7	100.0	100.0
2022-07-16	18.5	23.7	100.0	100.0
2022-07-17	21.2	28.9	100.0	100.0
2022-07-18	19.3	25.7	100.0	100.0
2022-07-19	17.1	24.4	95.8	95.8
2022-07-20	16.6	24.3	100.0	100.0
2022-07-21	13.3	20.3	100.0	100.0
2022-07-22	14.4	20.7	100.0	100.0
2022-07-23	13.3	19.2	100.0	100.0
2022-07-24	14.2	20.2	100.0	100.0
2022-07-25	11.1	18.9	100.0	100.0
2022-07-26	9.3	15.8	100.0	100.0
2022-07-27	11.1	20.6	100.0	100.0
2022-07-28	13.0	20.1	100.0	100.0
2022-07-29	14.3	20.1	100.0	100.0
2022-07-30	16.5	24.4	100.0	100.0
2022-07-31	14.4	21.6	100.0	100.0
2022-08-01	13.1	23.9	100.0	100.0
2022-08-02	13.2	20.1	100.0	100.0
2022-08-03	9.0	13.7	95.8	95.8
2022-08-04	7.1	12.1	100.0	100.0
2022-08-05	12.3	24.4	100.0	100.0
2022-08-06	11.0	18.9	100.0	100.0
2022-08-07	9.2	15.5	100.0	100.0
2022-08-08	9.7	15.5	100.0	100.0
2022-08-09	7.4	12.8	87.5	87.5
2022-08-10	6.3	18.4	100.0	100.0
2022-08-11	6.6	20.9	100.0	100.0
2022-08-12	7.1	12.4	100.0	100.0
2022-08-13	5.8	13.7	100.0	100.0
2022-08-14	6.7	11.9	100.0	100.0

(continued)

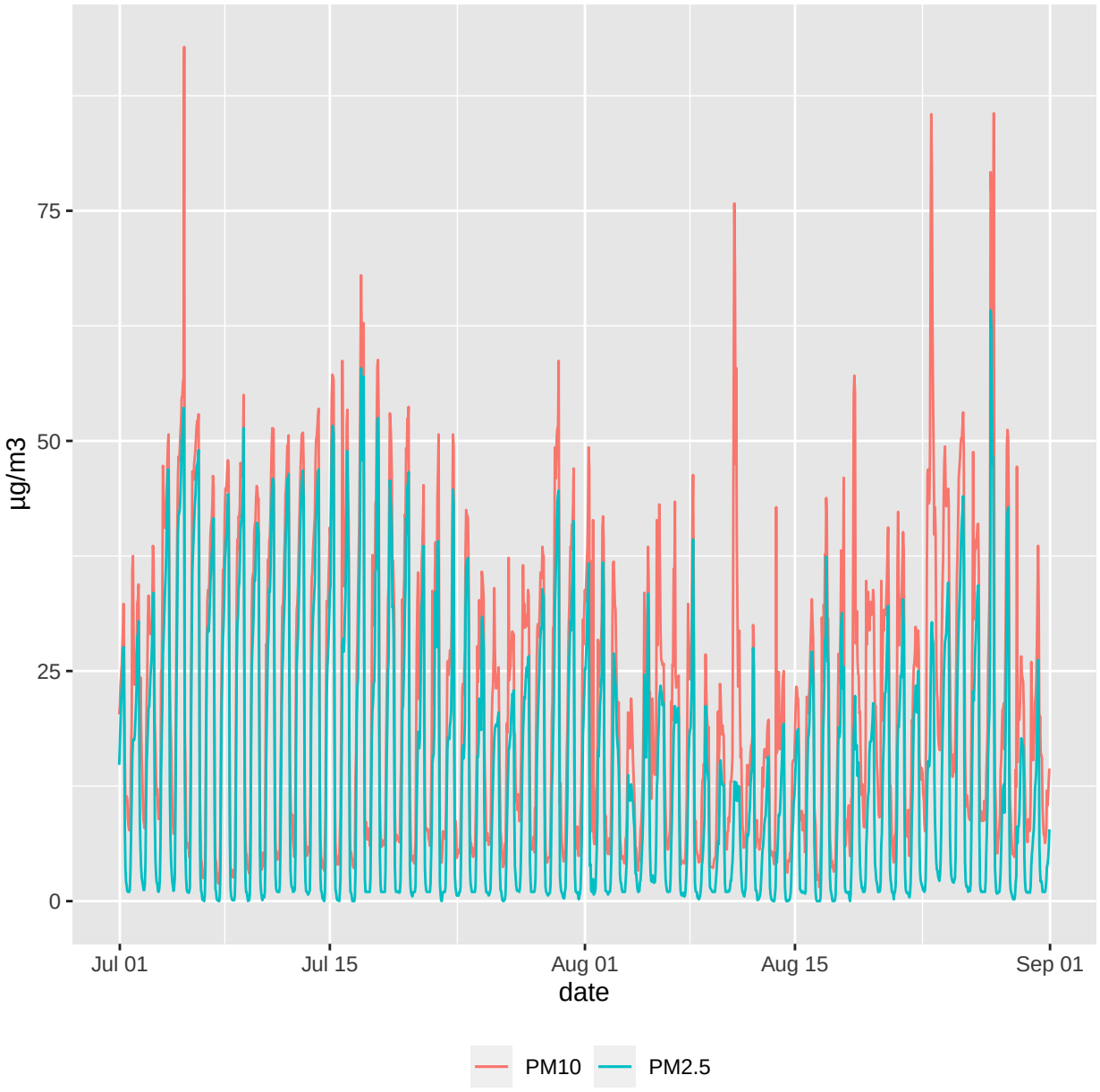
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-08-15	9.1	15.3	100.0	100.0
2022-08-16	11.4	16.7	91.7	91.7
2022-08-17	11.9	17.2	100.0	100.0
2022-08-18	10.9	21.8	100.0	100.0
2022-08-19	8.5	23.1	100.0	100.0
2022-08-20	9.9	23.4	100.0	100.0
2022-08-21	12.3	21.0	100.0	100.0
2022-08-22	12.3	19.9	100.0	100.0
2022-08-23	10.6	23.7	100.0	100.0
2022-08-24	14.4	39.5	100.0	100.0
2022-08-25	16.5	30.3	95.8	95.8
2022-08-26	17.2	28.1	100.0	100.0
2022-08-27	13.1	21.7	100.0	100.0
2022-08-28	17.8	29.1	100.0	100.0
2022-08-29	11.7	22.0	91.7	91.7
2022-08-30	6.9	15.9	100.0	100.0
2022-08-31	7.4	16.7	100.0	100.0

Monthly Average

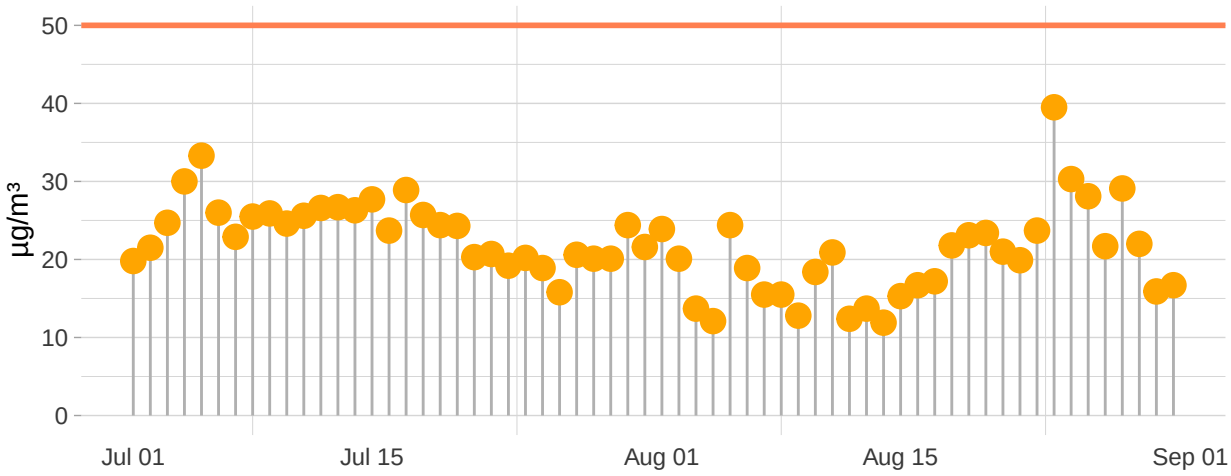
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
July 2022	17.22258	23.74194	99.59355	99.59355
August 2022	10.52903	19.98710	98.79032	98.79032

NA - Not enough data to calculate averages

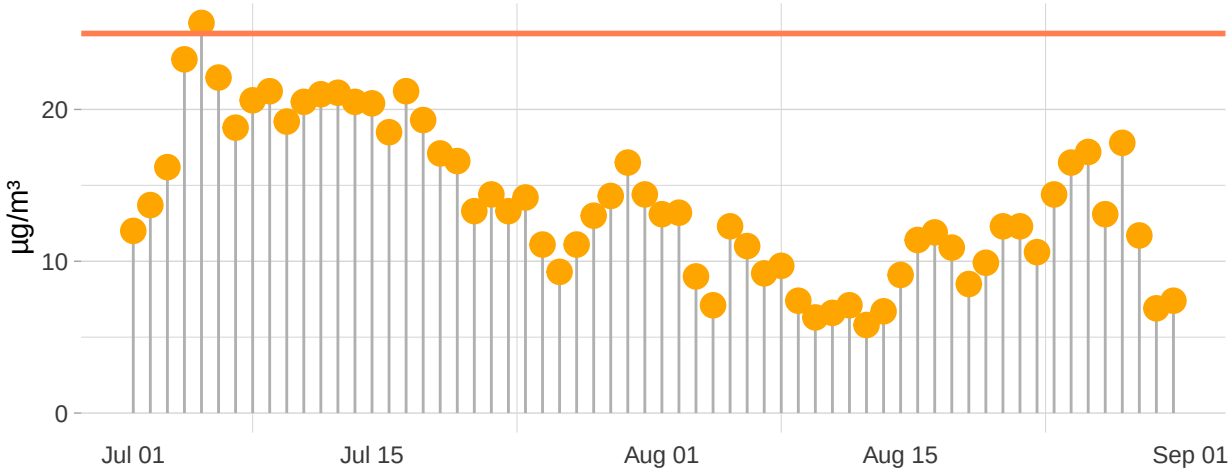
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

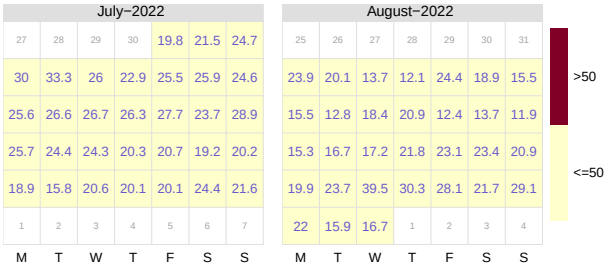


BENNETT RESOURCES

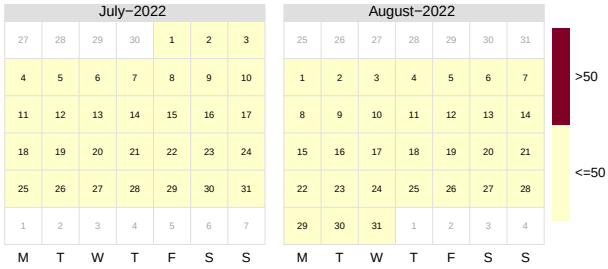
SITE: Ben398
Bi-Monthly Report
July 2022 - August 2022

Daily Exceedances

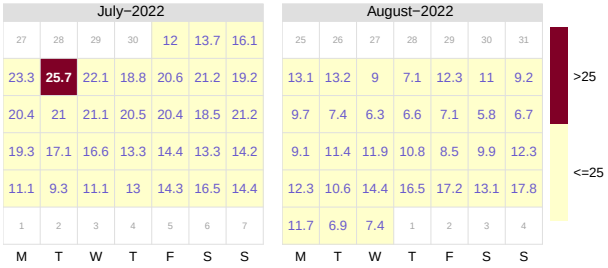
PM_{10}. Daily Exceedances at Ben398



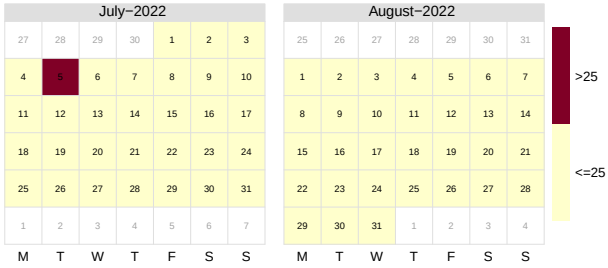
PM_{10}. Days with Exceedances at Ben398



$PM_{2.5}$. Daily Exceedances at Ben398



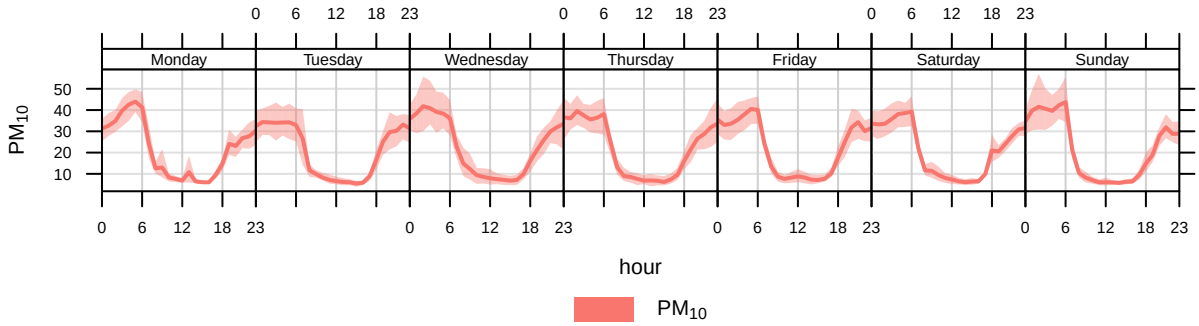
$PM_{2.5}$. Days with Exceedances at Ben398

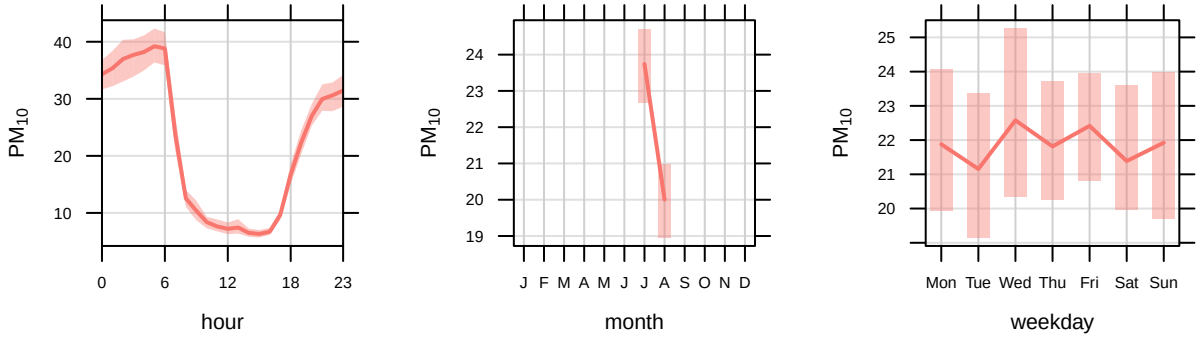


BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
July 2022 - August 2022

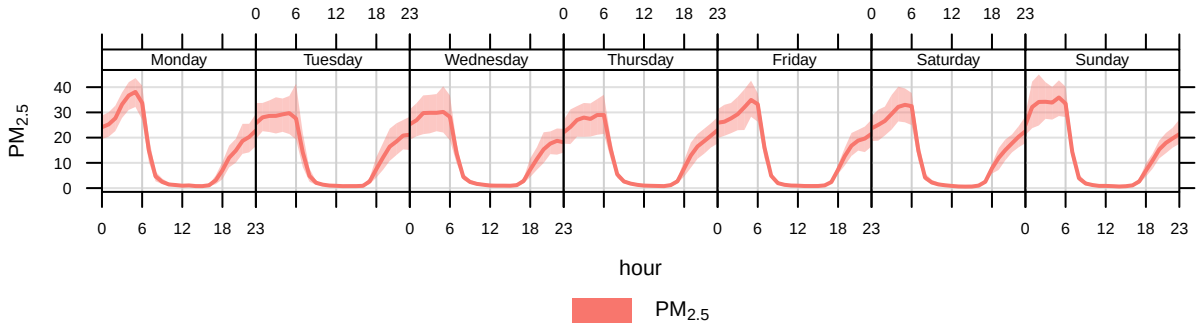
PM_{10} Time variation at Ben398

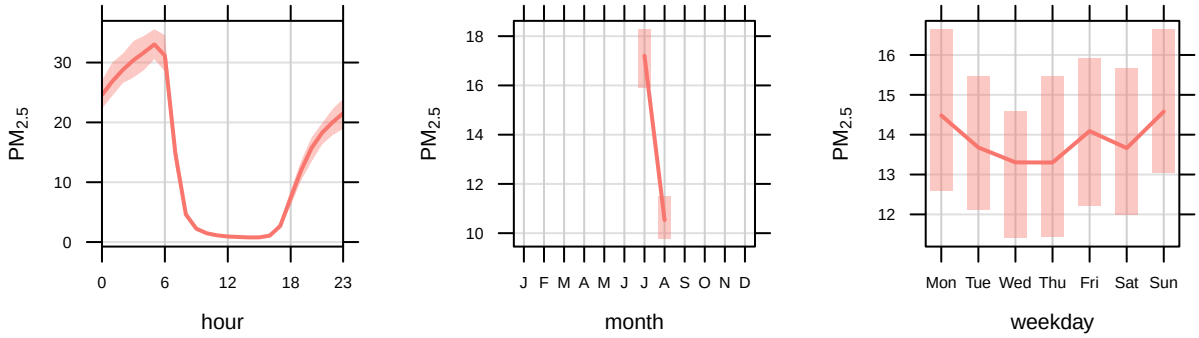




mean and 95% confidence interval in mean

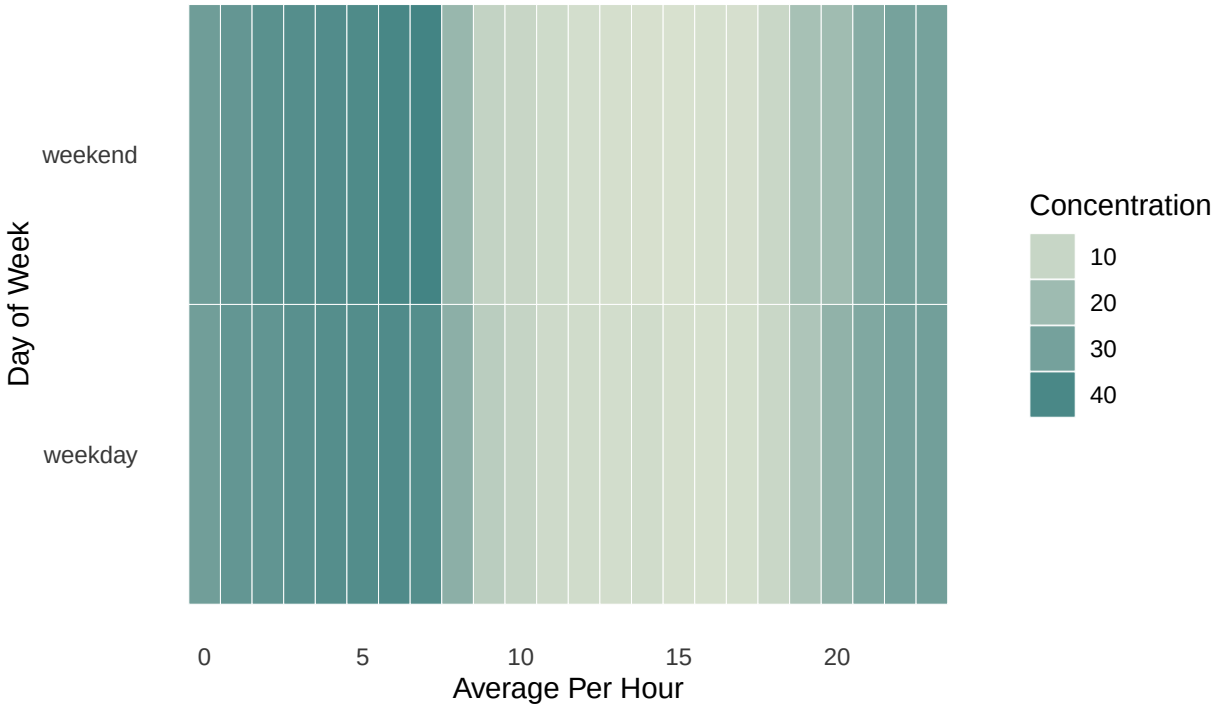
$PM_{2.5}$ Time variation at Ben398



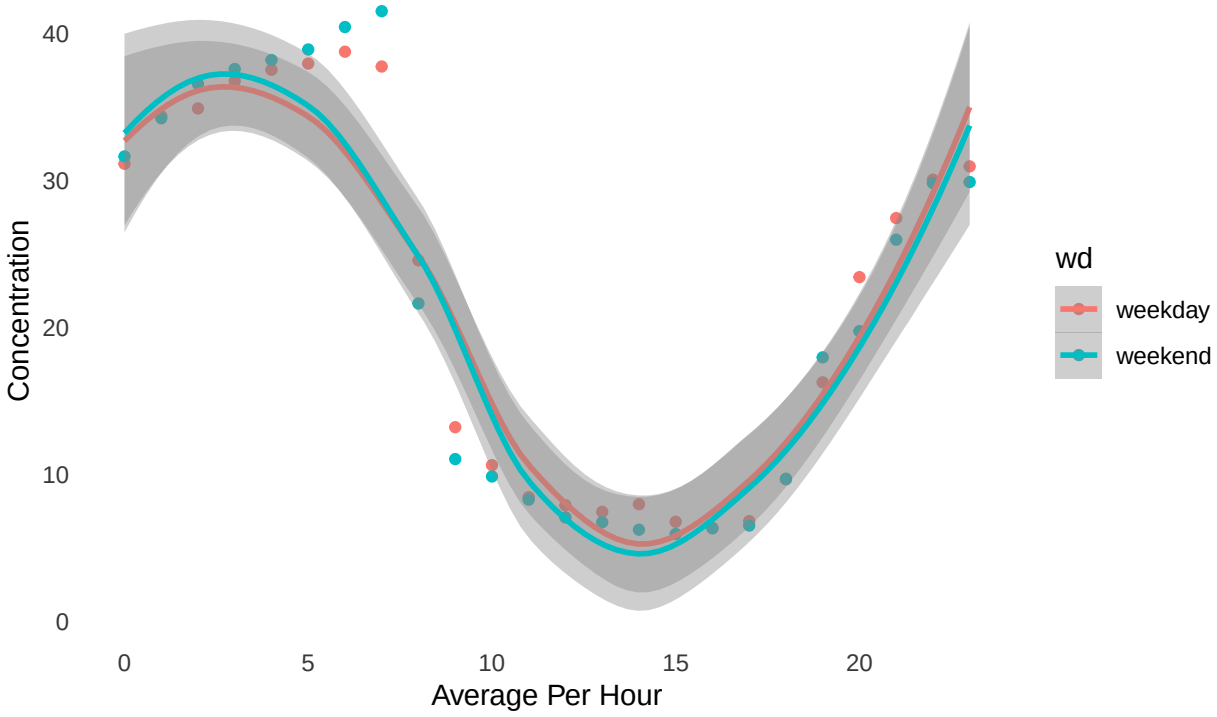


mean and 95% confidence interval in mean

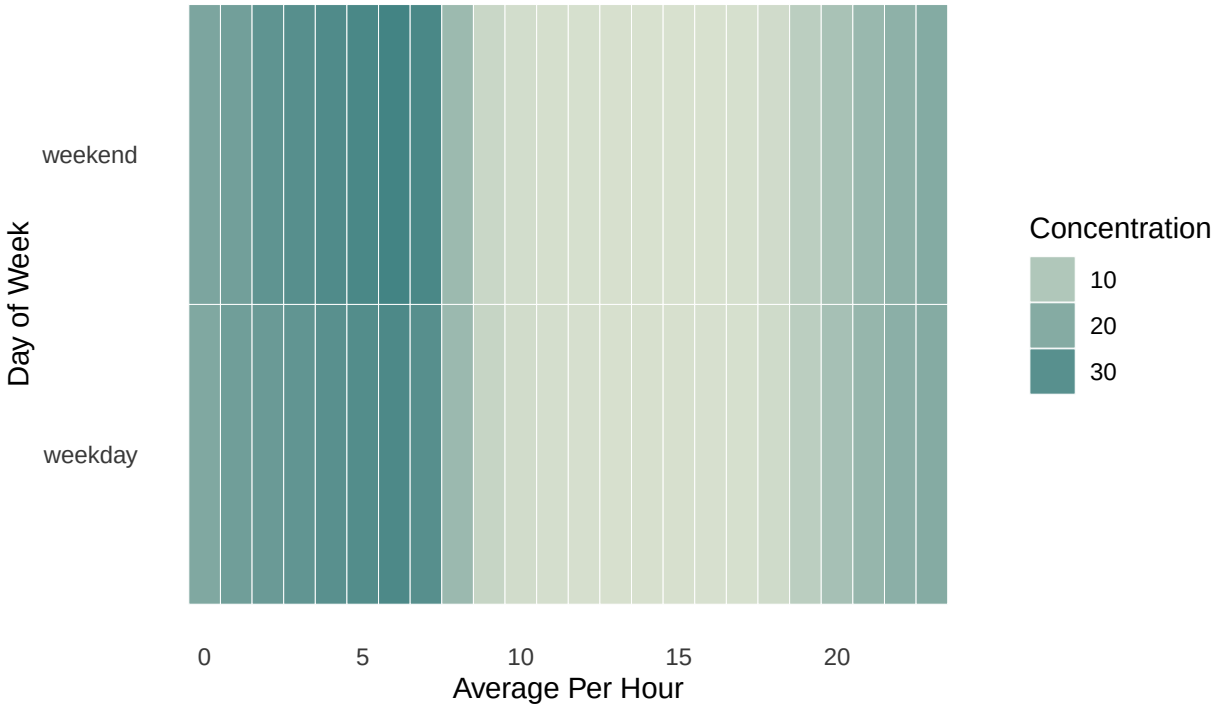
PM10 concentration by Weekday/weekend and Hour



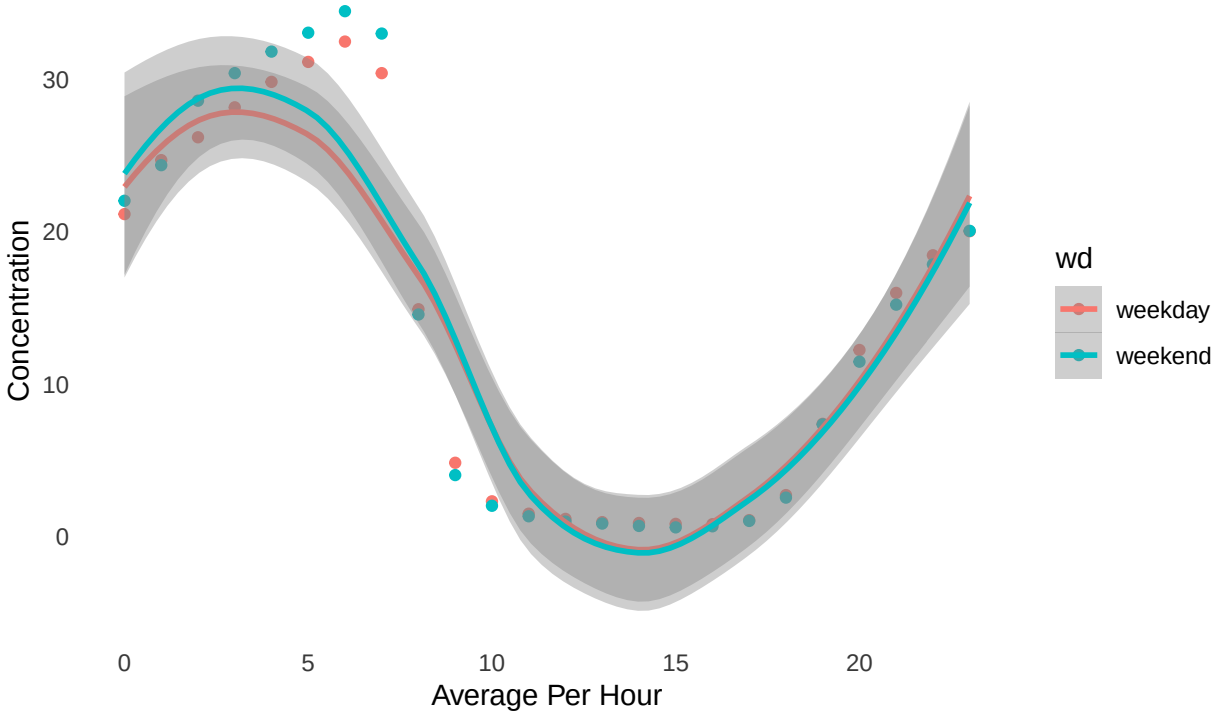
PM10 concentration by weekday and weekend with trend



PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend



Bi-Monthly Air Quality Reports 2022 [BEN398]

September-October 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
September 2022 - October 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-09-01	5.1	12.2	83.3	83.3
2022-09-02	4.6	10.9	100.0	100.0
2022-09-03	3.1	8.2	100.0	100.0
2022-09-04	3.5	7.6	100.0	100.0
2022-09-05	4.3	7.5	100.0	100.0
2022-09-06	5.6	9.4	100.0	100.0
2022-09-07	5.4	9.5	100.0	100.0
2022-09-08	7.6	12.0	100.0	100.0
2022-09-09	7.6	11.5	100.0	100.0
2022-09-10	6.0	10.2	100.0	100.0
2022-09-11	6.9	10.4	100.0	100.0
2022-09-12	5.6	9.8	100.0	100.0
2022-09-13	6.4	11.4	100.0	100.0
2022-09-14	5.6	10.1	95.8	95.8
2022-09-15	4.7	11.8	100.0	100.0
2022-09-16	4.6	10.5	100.0	100.0
2022-09-17	4.9	10.2	100.0	100.0
2022-09-18	6.5	13.4	100.0	100.0
2022-09-19	5.5	12.2	100.0	100.0
2022-09-20	9.2	23.9	100.0	100.0
2022-09-21	4.0	12.9	100.0	100.0
2022-09-22	4.0	13.6	95.8	95.8
2022-09-23	4.8	12.0	100.0	100.0
2022-09-24	4.8	10.1	100.0	100.0
2022-09-25	4.7	11.5	100.0	100.0
2022-09-26	5.8	13.4	100.0	100.0
2022-09-27	4.7	12.7	100.0	100.0
2022-09-28	5.0	11.0	100.0	100.0
2022-09-29	4.8	9.6	100.0	100.0
2022-09-30	4.2	7.6	100.0	100.0
2022-10-01	2.7	5.2	91.7	91.7
2022-10-02	NA	NA	NA	NA
2022-10-03	5.1	9.0	100.0	100.0
2022-10-04	4.5	7.2	100.0	100.0
2022-10-05	4.2	6.4	100.0	100.0
2022-10-06	3.9	6.2	100.0	100.0
2022-10-07	2.4	4.6	100.0	100.0
2022-10-08	2.7	7.1	100.0	100.0
2022-10-09	2.8	8.0	100.0	100.0
2022-10-10	3.4	9.2	100.0	100.0
2022-10-11	3.5	7.7	87.5	87.5
2022-10-12	5.1	10.1	75.0	75.0
2022-10-13	7.2	19.0	100.0	100.0
2022-10-14	4.6	11.2	100.0	100.0
2022-10-15	4.3	10.3	100.0	100.0

(continued)

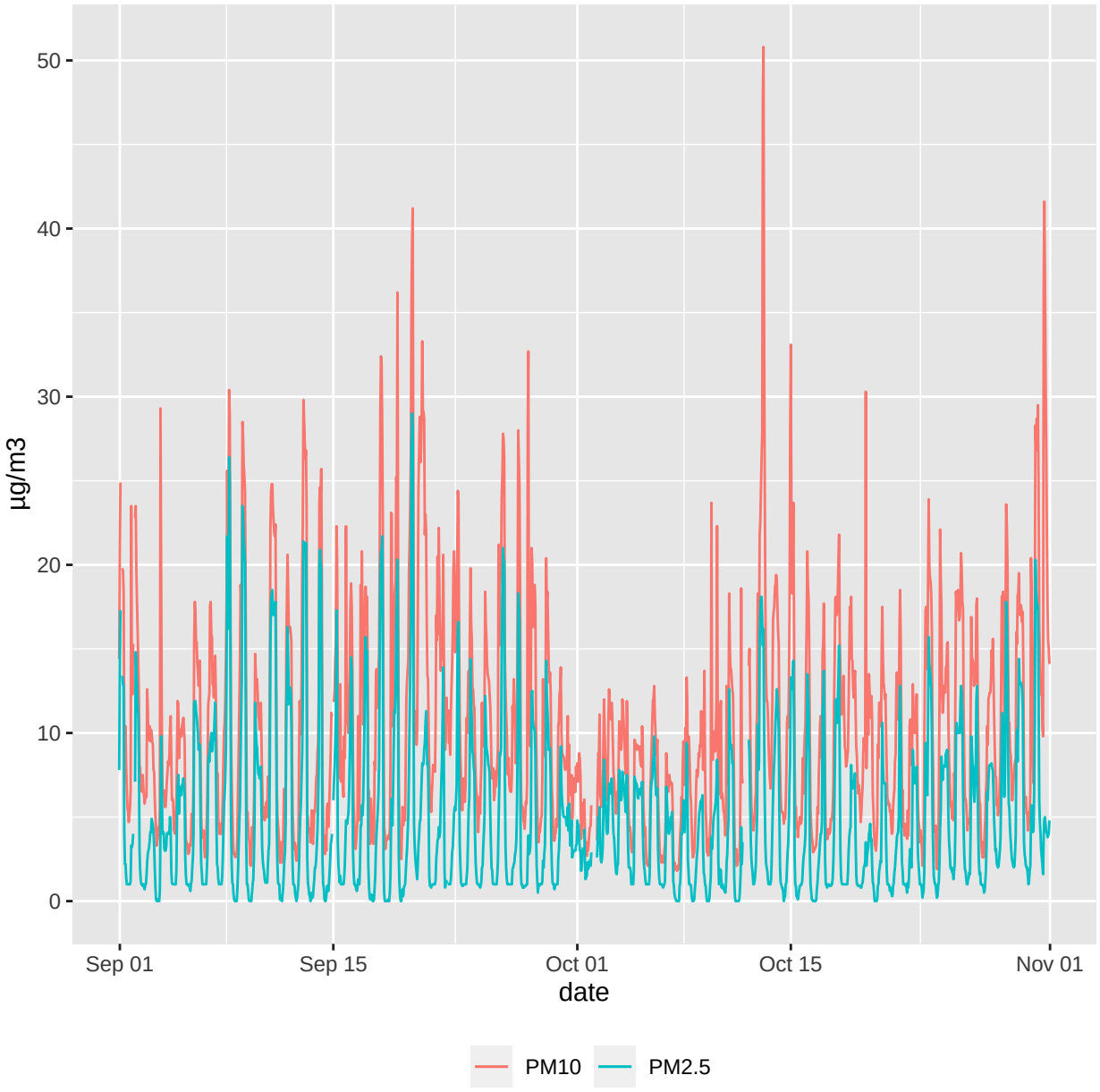
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-10-16	3.6	8.4	100.0	100.0
2022-10-17	4.4	8.7	100.0	100.0
2022-10-18	4.6	13.6	100.0	100.0
2022-10-19	2.9	10.0	100.0	100.0
2022-10-20	2.1	9.0	100.0	100.0
2022-10-21	3.1	8.7	100.0	100.0
2022-10-22	3.3	8.3	100.0	100.0
2022-10-23	4.6	8.8	100.0	100.0
2022-10-24	5.9	11.7	100.0	100.0
2022-10-25	5.7	11.2	100.0	100.0
2022-10-26	6.0	11.8	100.0	100.0
2022-10-27	4.1	8.5	100.0	100.0
2022-10-28	5.8	11.2	100.0	100.0
2022-10-29	7.3	12.7	100.0	100.0
2022-10-30	5.7	10.7	100.0	100.0
2022-10-31	7.6	22.1	100.0	100.0

Monthly Average

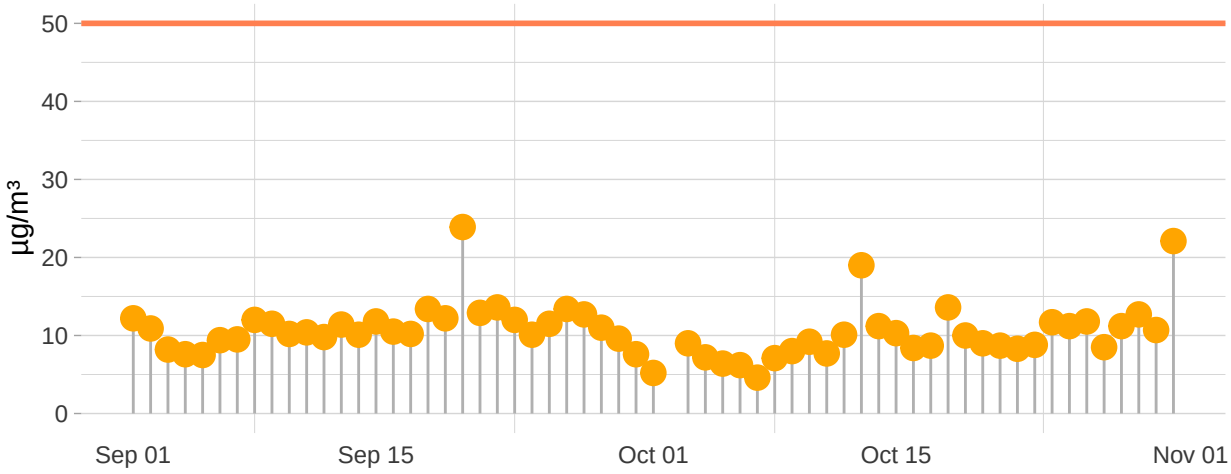
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
September 2022	5.316667	11.236667	99.16333	99.16333
October 2022	4.436667	9.886667	98.47333	98.47333

NA - Not enough data to calculate averages

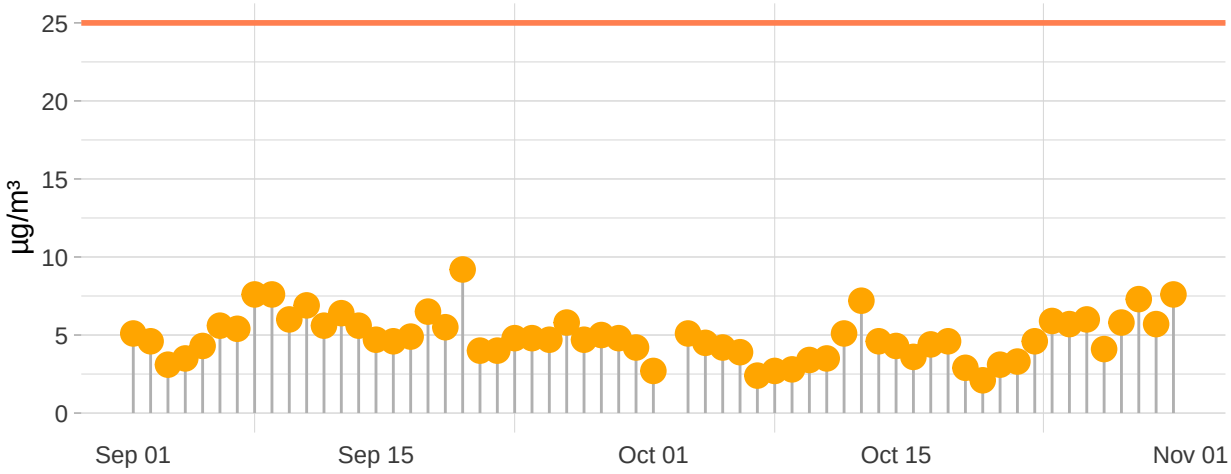
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

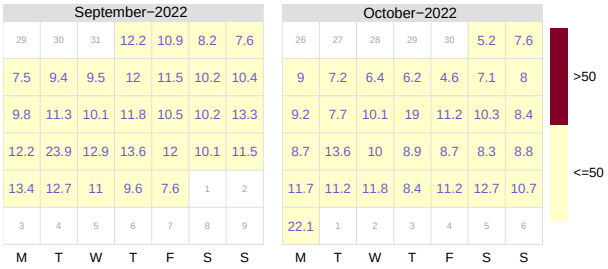


BENNETT RESOURCES

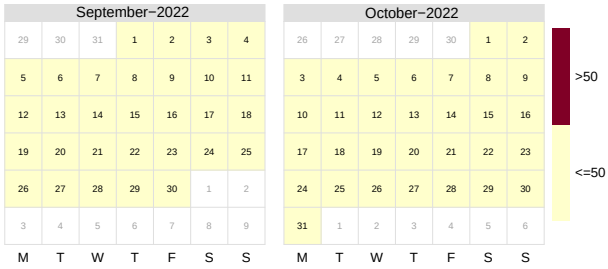
SITE: Ben398
Bi-Monthly Report
September 2022 - October 2022

Daily Exceedances

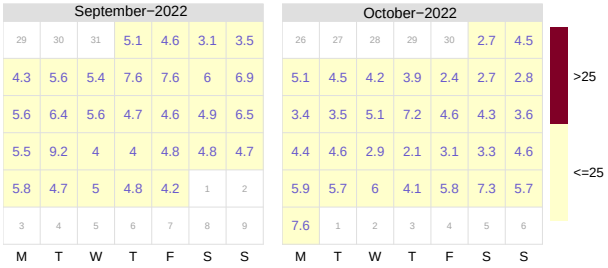
PM_{10}. Daily Exceedances at Ben398



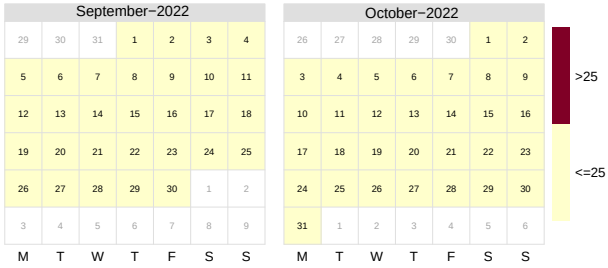
PM_{10}. Days with Exceedances at Ben398



$PM_{2.5}$. Daily Exceedances at Ben398



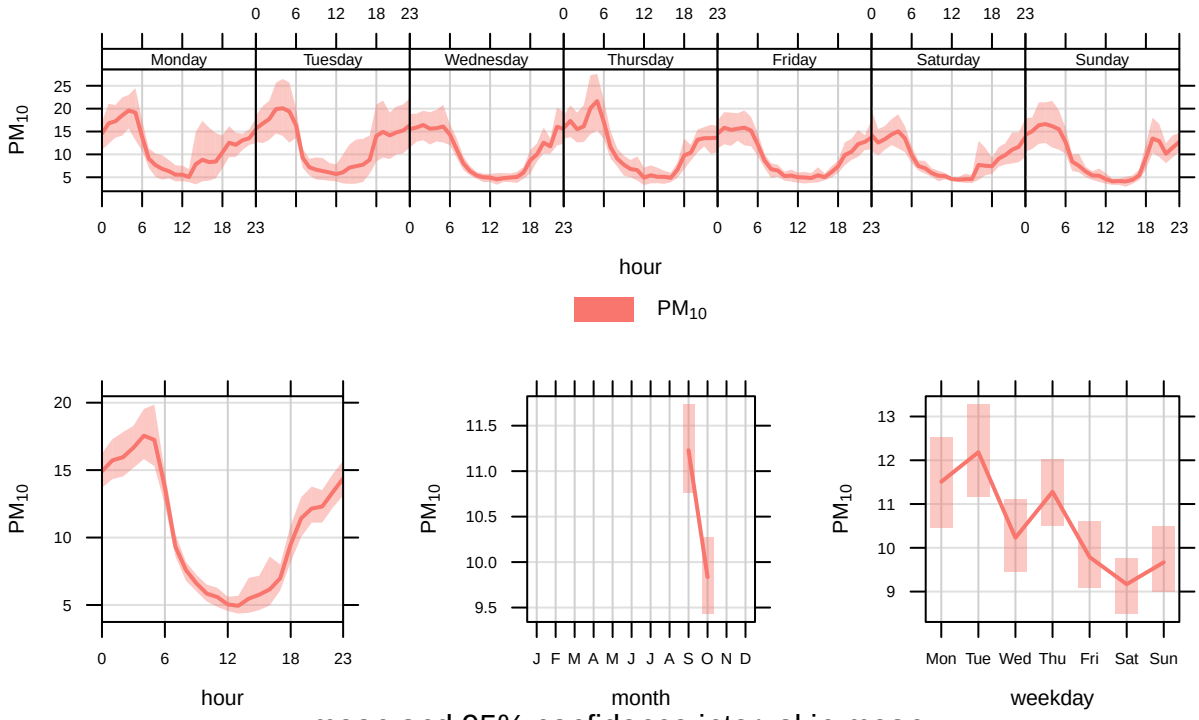
$PM_{2.5}$. Days with Exceedances at Ben398



BENNETT RESOURCES

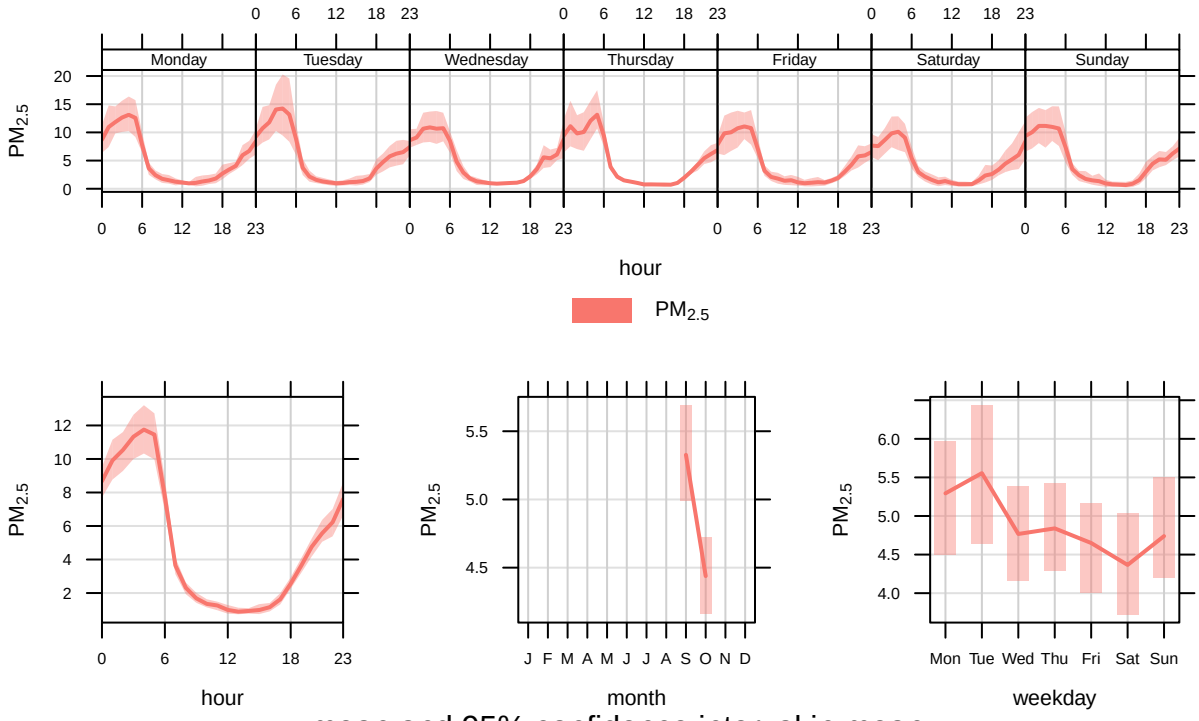
SITE: Ben398
Bi-Monthly Report
September 2022 - October 2022

PM_{10} Time variation at Ben398



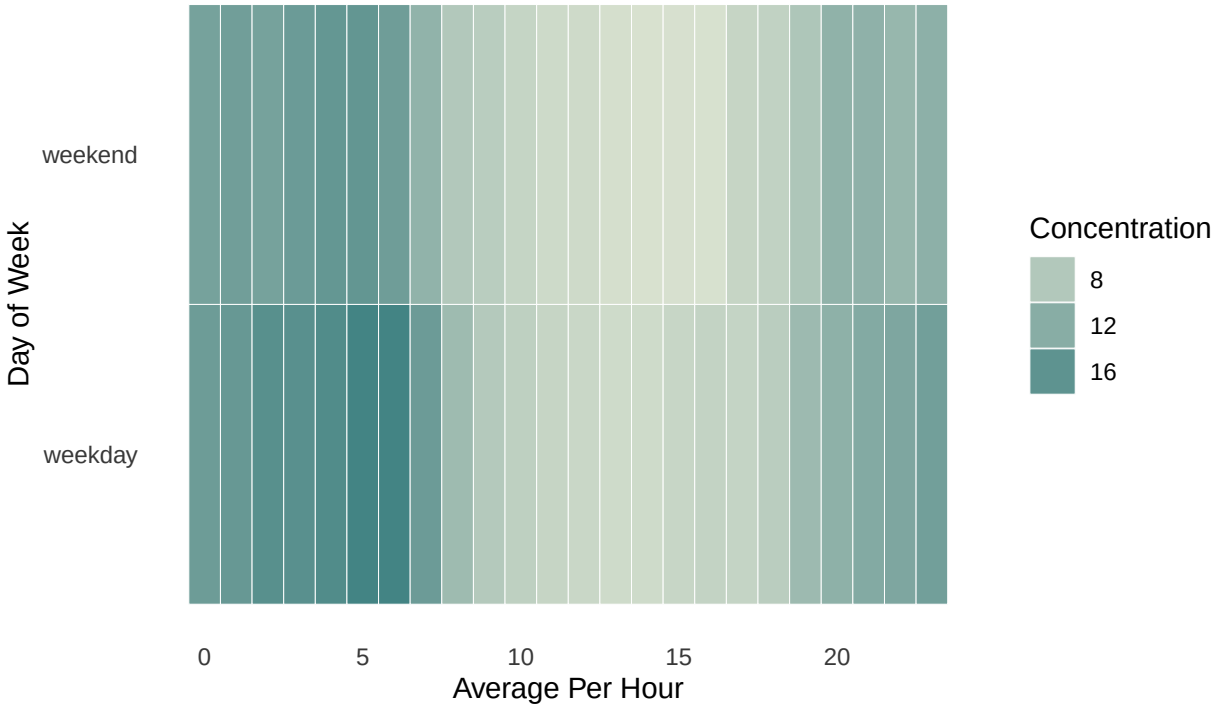
mean and 95% confidence interval in mean

$PM_{2.5}$ Time variation at Ben398

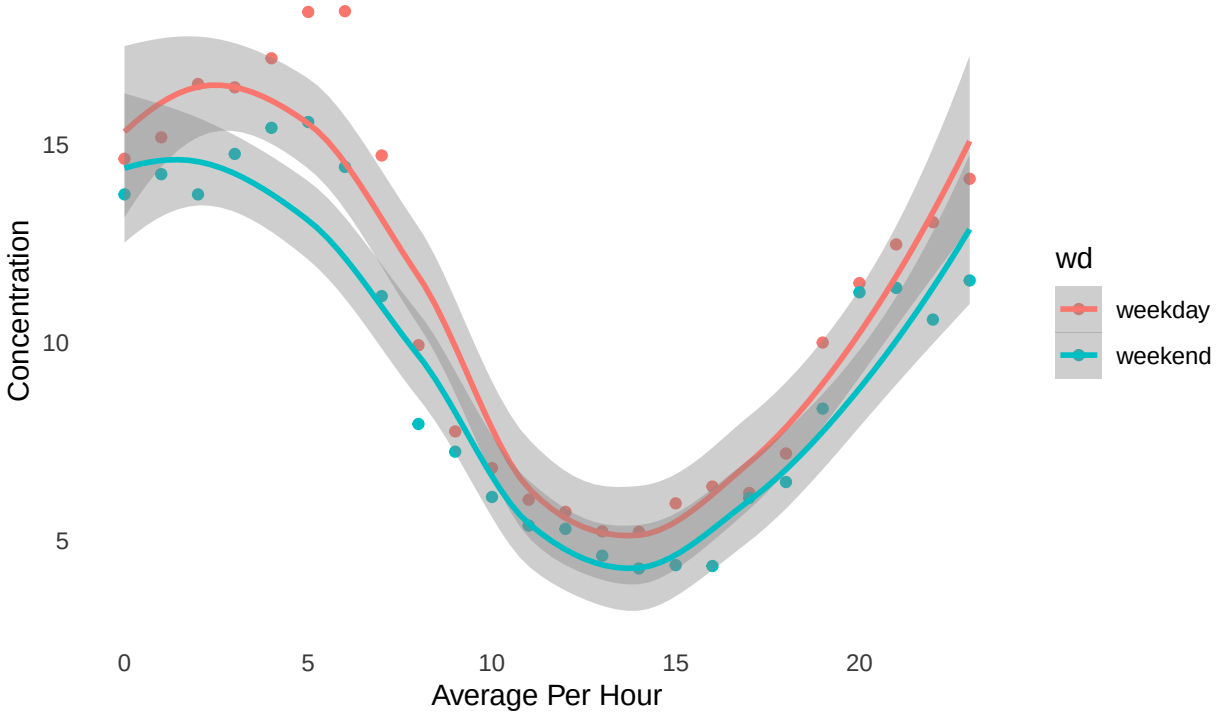


mean and 95% confidence interval in mean

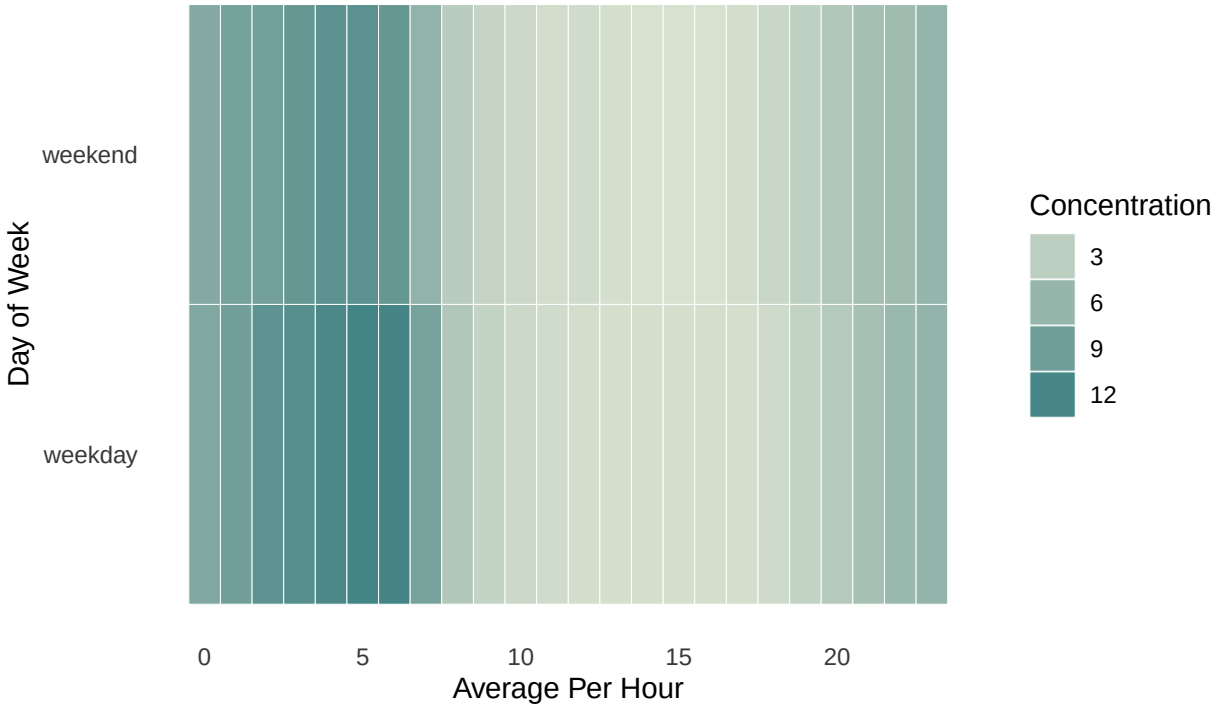
PM10 concentration by Weekday/weekend and Hour



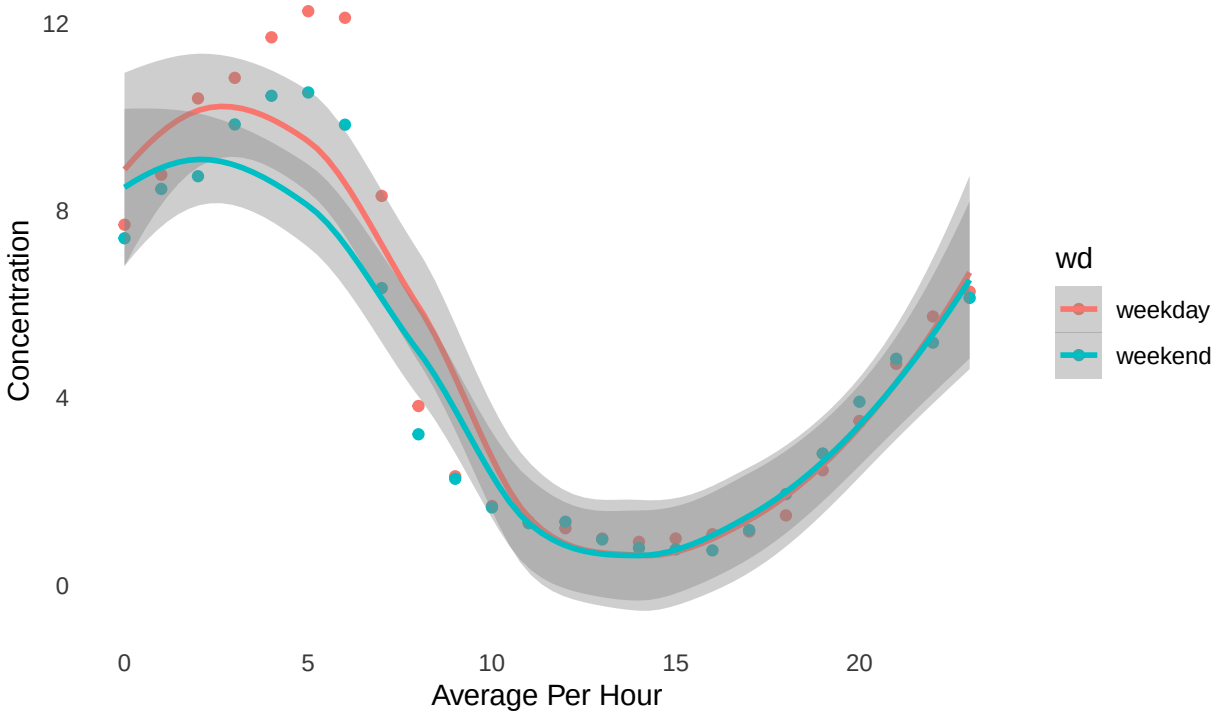
PM10 concentration by weekday and weekend with trend



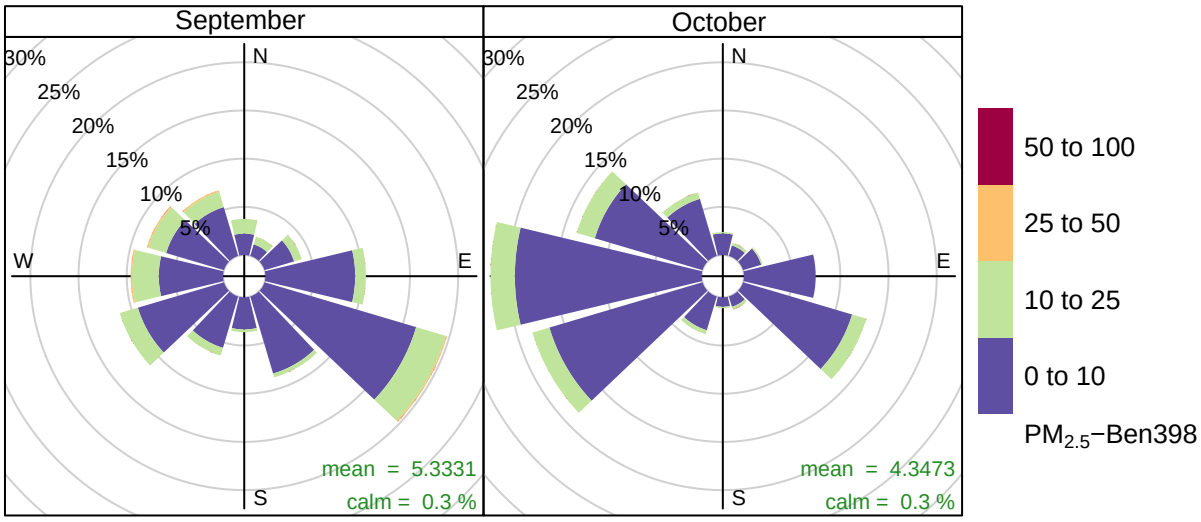
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

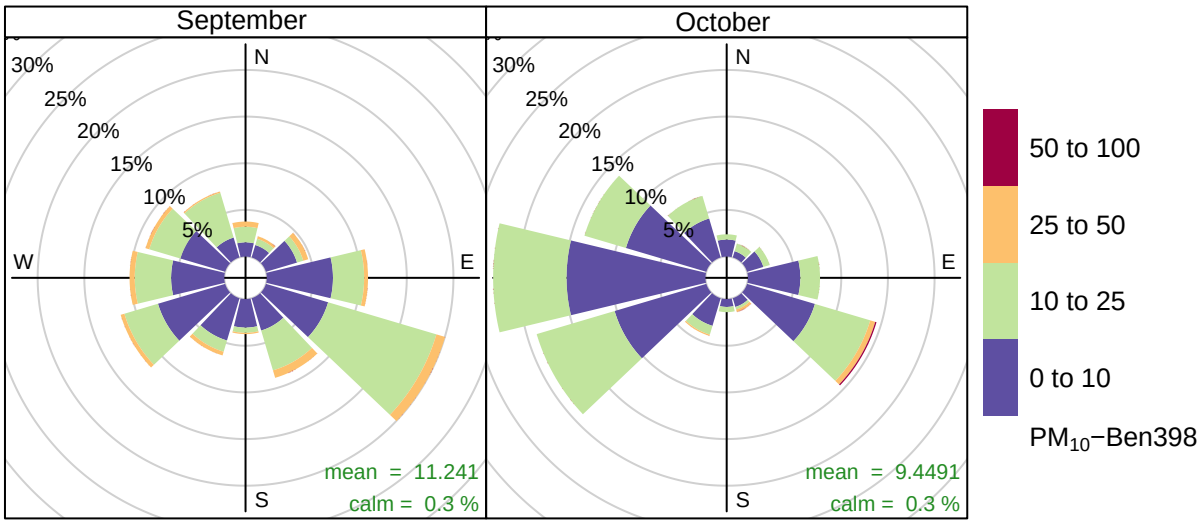


$PM_{2.5}$ pollution rose at Ben398



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben398



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN398]

November 2022

BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
November 2022 - November 2022

Daily Averages

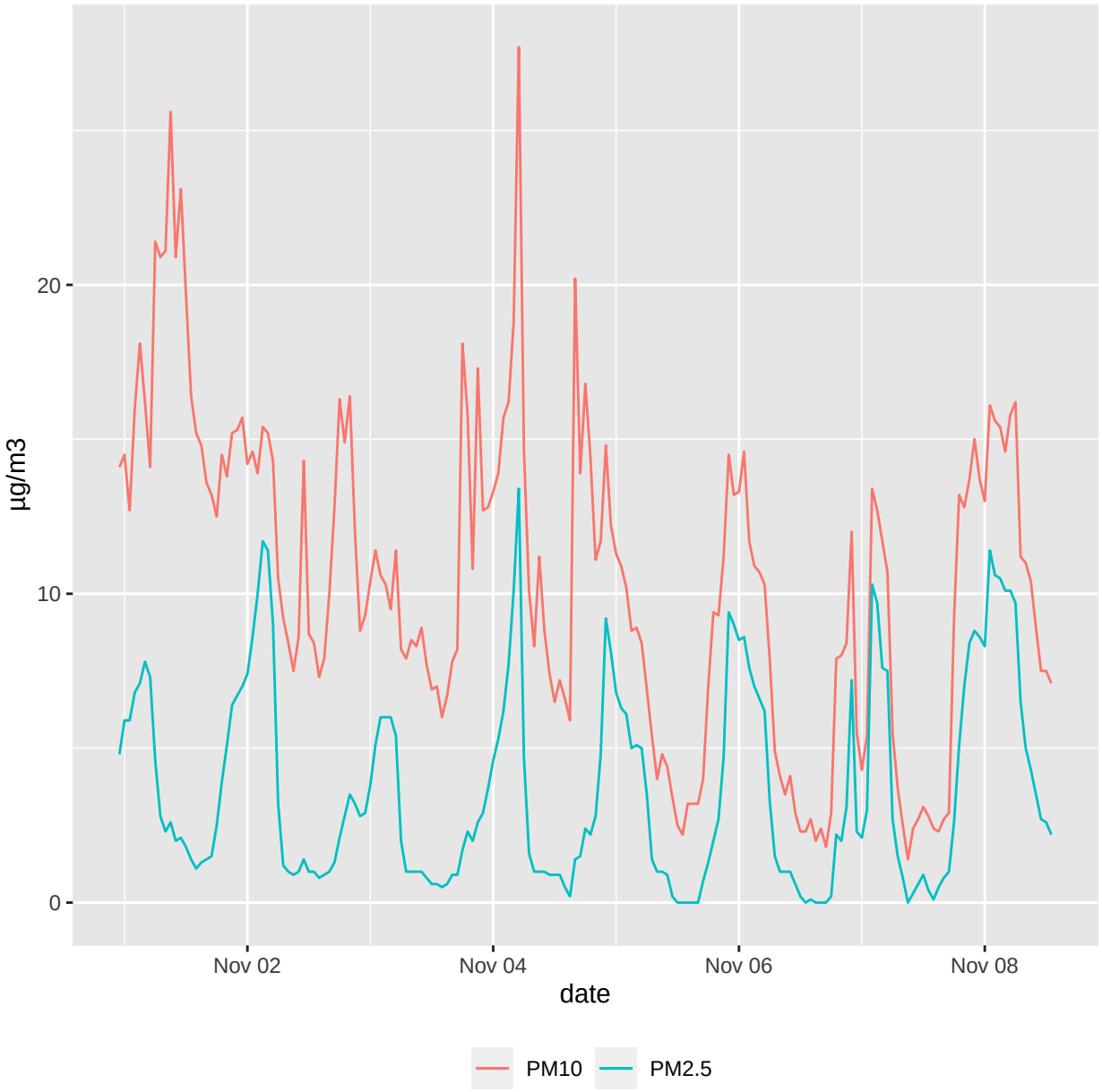
	µg/m³	µg/m³	%	%
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
2022-11-01	4.1	16.9	100.0	100.0
2022-11-02	3.8	11.6	100.0	100.0
2022-11-03	2.4	10.1	100.0	100.0
2022-11-04	3.9	12.8	100.0	100.0
2022-11-05	3.0	7.1	100.0	100.0
2022-11-06	2.9	6.5	100.0	100.0
2022-11-07	3.8	7.1	100.0	100.0
2022-11-08	NA	NA	58.3	58.3

Monthly Average

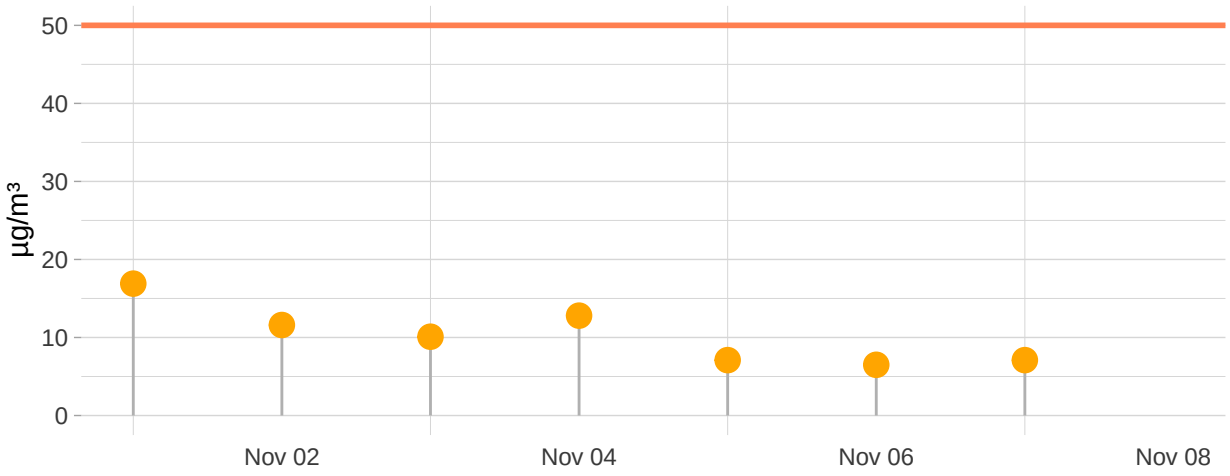
	PM2.5-Ben398	PM10-Ben398	PM2.5 data capture-Ben398	PM10 data capture-Ben398
November 2022	NA	NA	NA	NA

NA - Not enough data to calculate averages

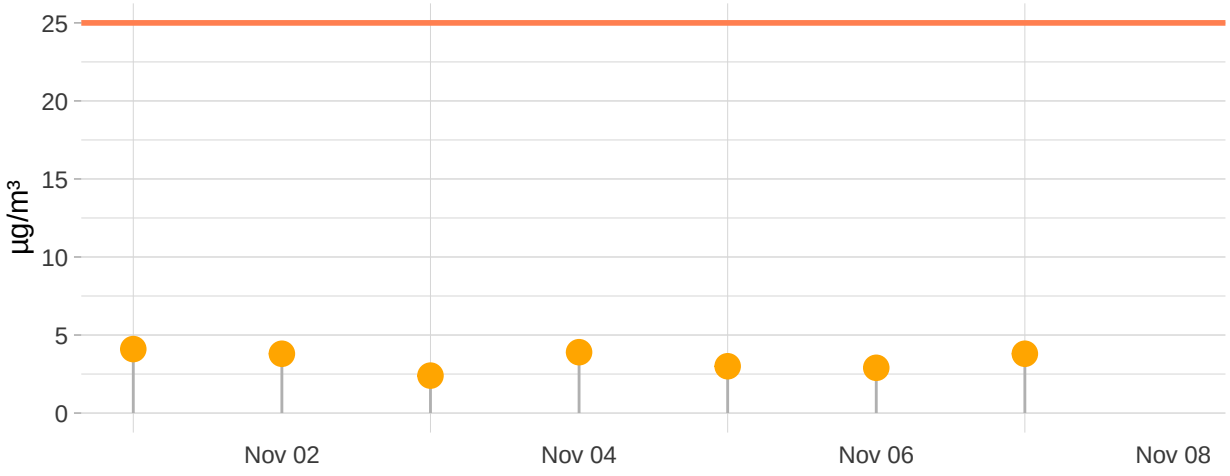
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

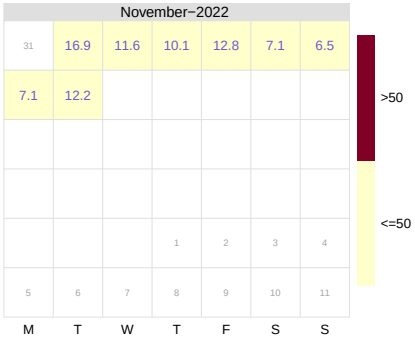


BENNETT RESOURCES

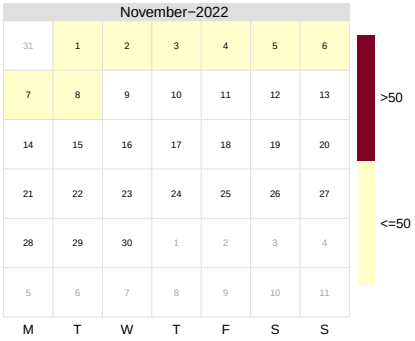
SITE: Ben398
Bi-Monthly Report
November 2022 - November 2022

Daily Exceedances

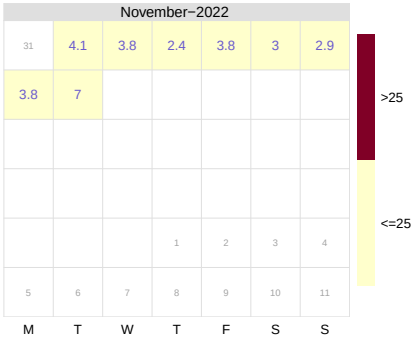
PM_{10}. Daily Exceedances at Ben398



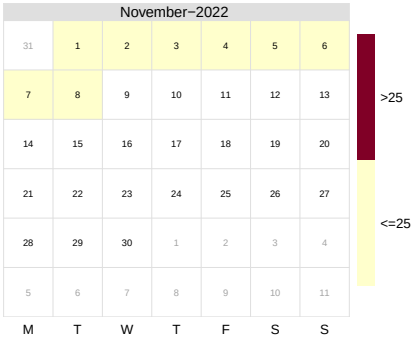
PM_{10}. Days with Exceedances at Ben398



$PM_{2.5}$. Daily Exceedances at Ben398



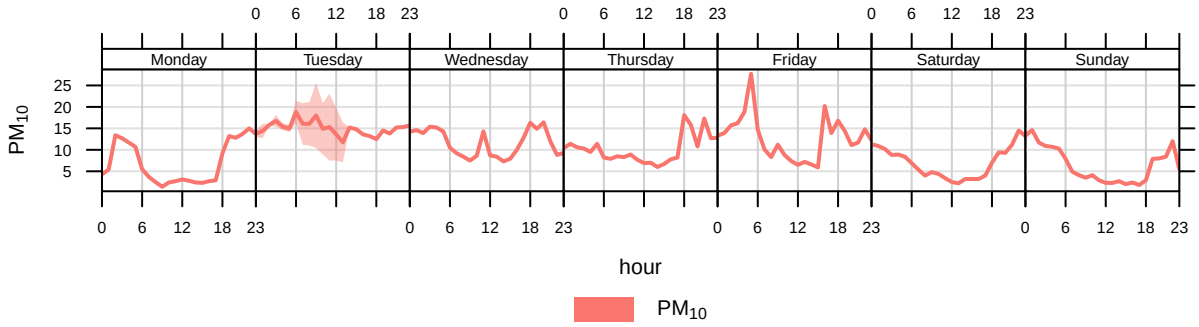
$PM_{2.5}$. Days with Exceedances at Ben398

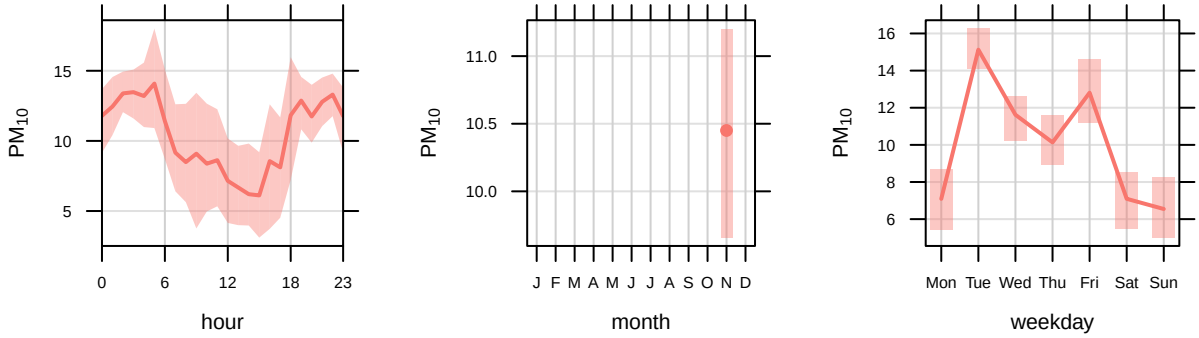


BENNETT RESOURCES

SITE: Ben398
Bi-Monthly Report
November 2022 - November 2022

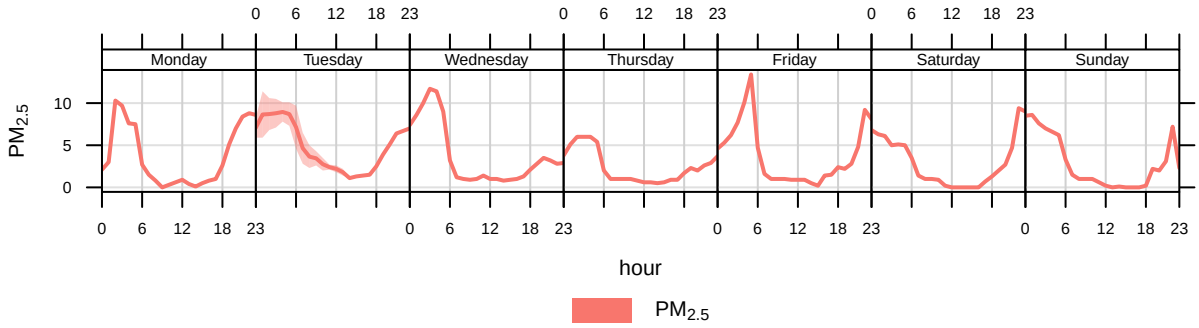
PM_{10} Time variation at Ben398

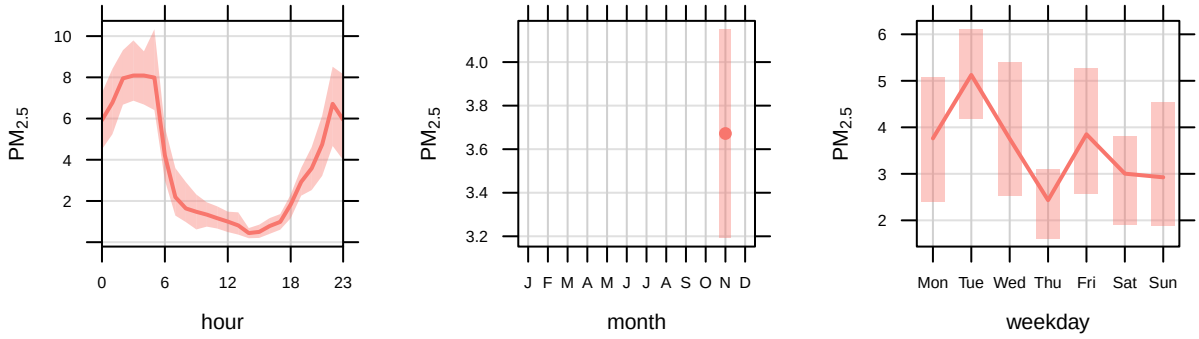




mean and 95% confidence interval in mean

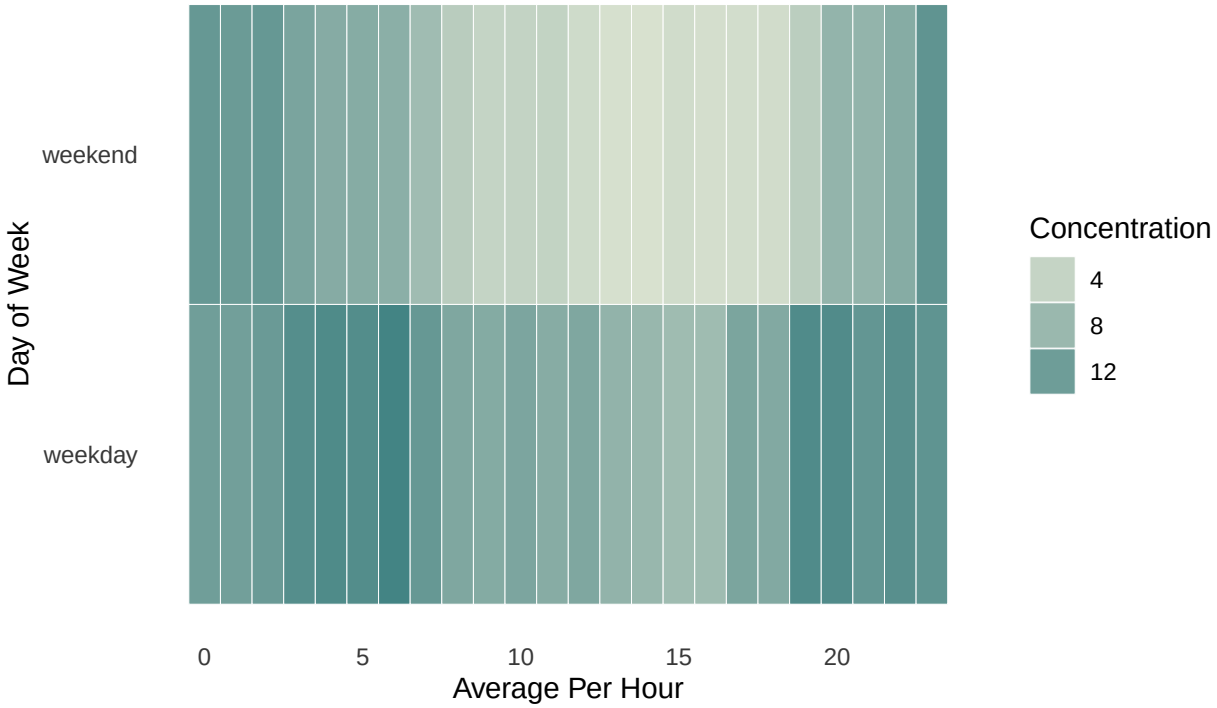
$PM_{2.5}$ Time variation at Ben398



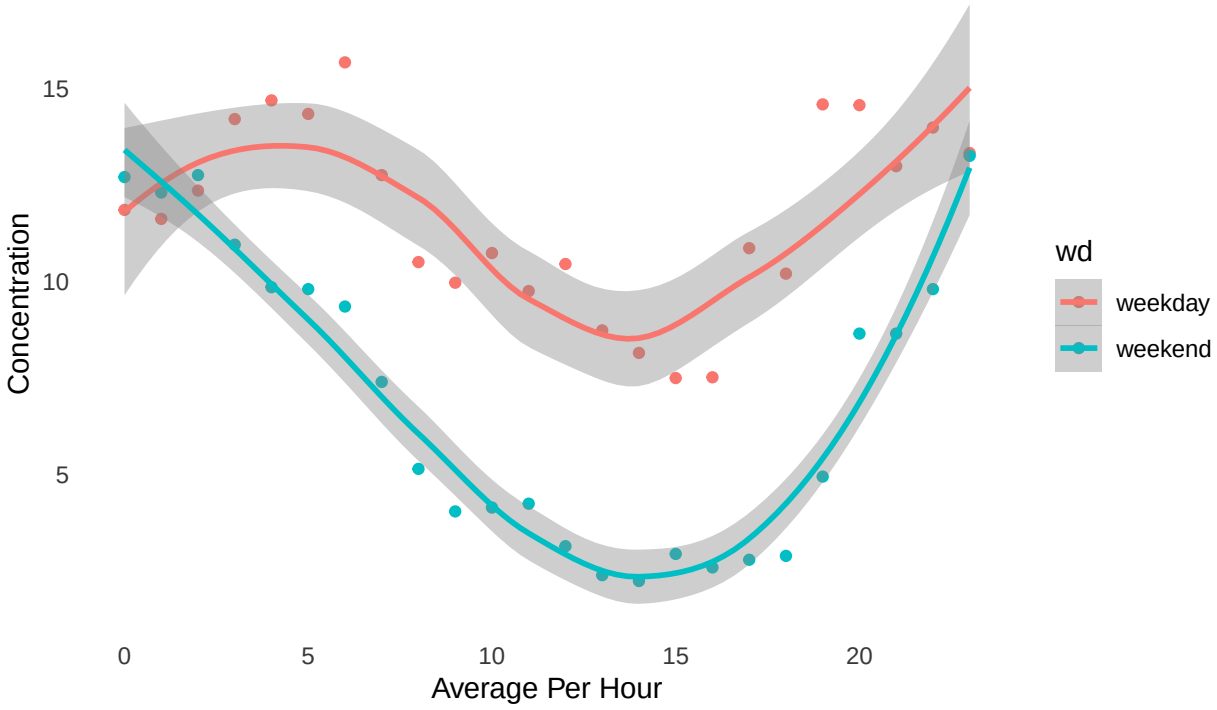


mean and 95% confidence interval in mean

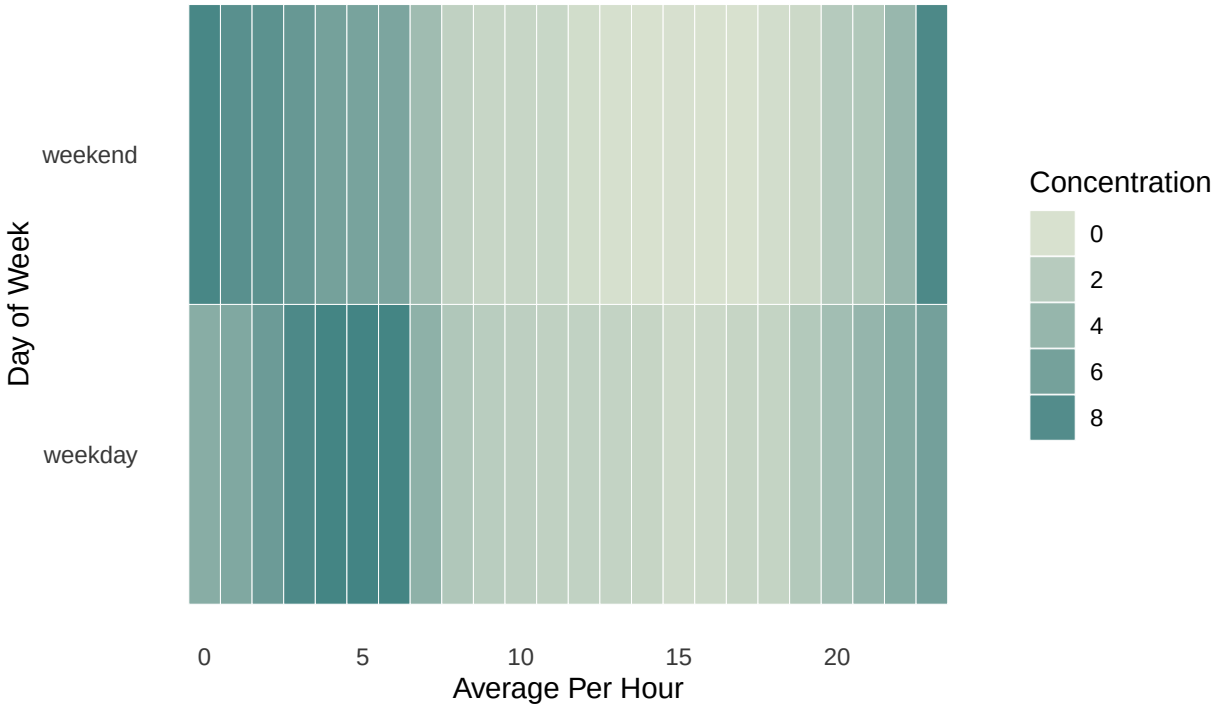
PM10 concentration by Weekday/weekend and Hour



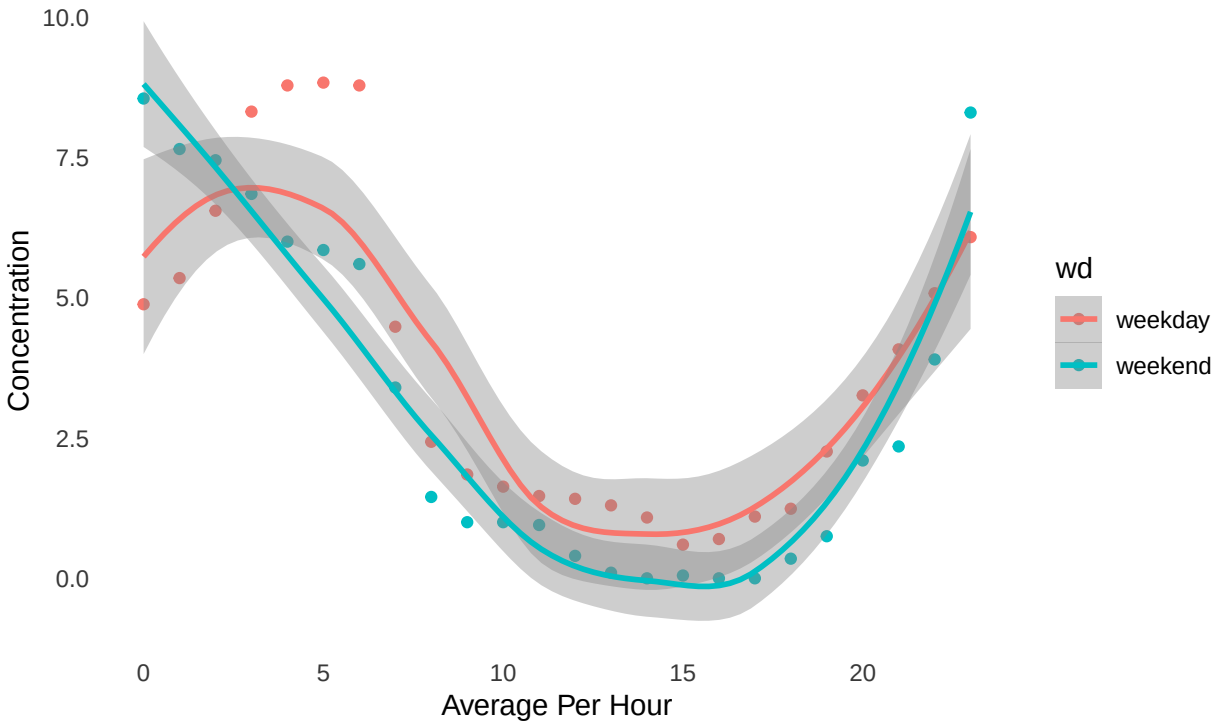
PM10 concentration by weekday and weekend with trend



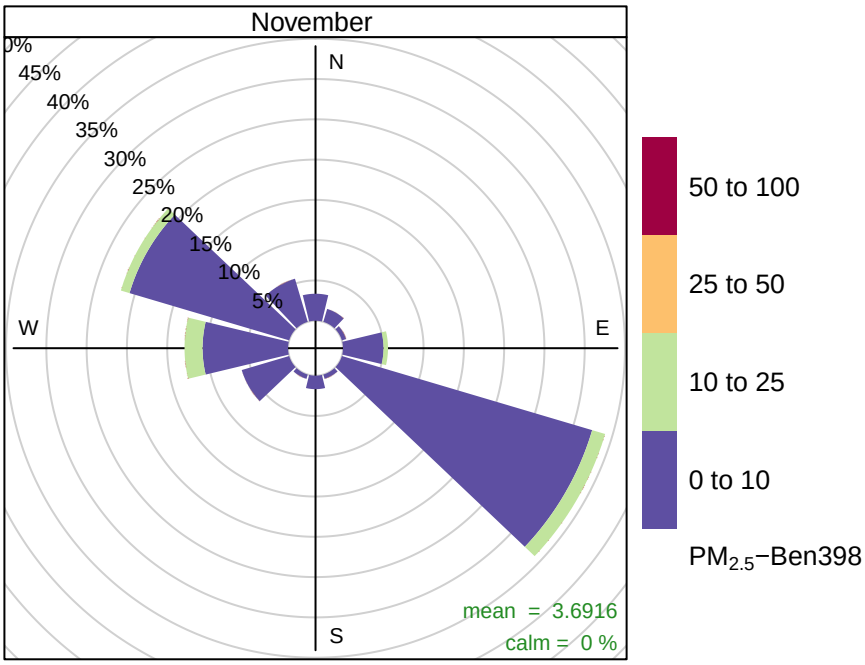
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

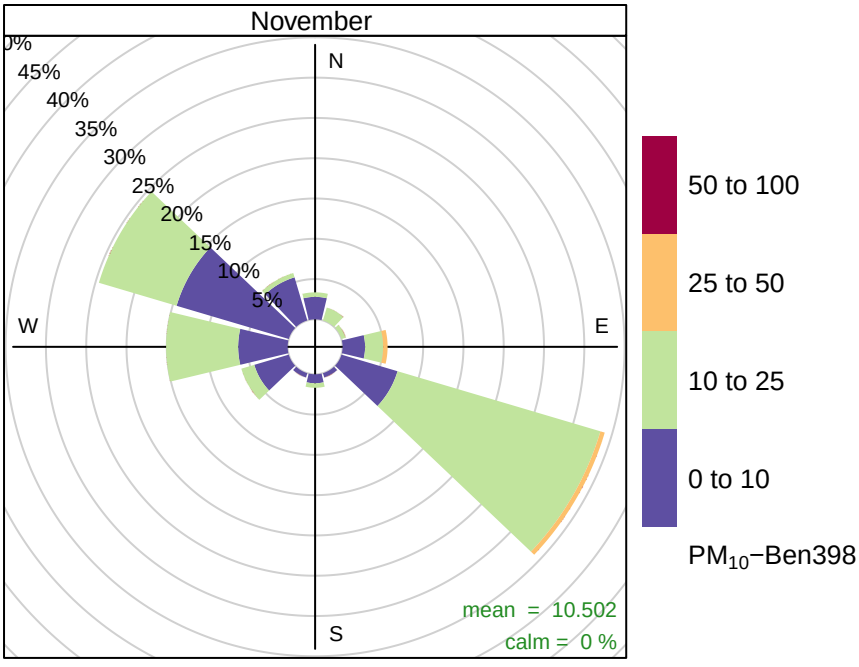


$PM_{2.5}$ pollution rose at Ben398



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben398



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

May-June 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
May 2022 - June 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-05-03	NA	NA	62.5	62.5
2022-05-04	4.2	61.0	95.8	95.8
2022-05-05	3.6	55.5	100.0	100.0
2022-05-06	4.4	44.0	100.0	100.0
2022-05-07	2.3	26.7	100.0	100.0
2022-05-08	2.3	24.0	100.0	100.0
2022-05-09	2.4	33.7	100.0	100.0
2022-05-10	5.7	86.6	100.0	100.0
2022-05-11	4.4	62.0	100.0	100.0
2022-05-12	2.4	25.5	100.0	100.0
2022-05-13	2.0	15.3	100.0	100.0
2022-05-14	1.9	13.4	100.0	100.0
2022-05-15	4.2	44.6	100.0	100.0
2022-05-16	5.1	85.8	100.0	100.0
2022-05-17	4.8	55.8	100.0	100.0
2022-05-18	5.1	83.1	100.0	100.0
2022-05-19	8.3	133.3	100.0	100.0
2022-05-20	1.9	24.0	100.0	100.0
2022-05-21	2.8	41.8	100.0	100.0
2022-05-22	2.6	33.8	100.0	100.0
2022-05-23	1.6	22.9	100.0	100.0
2022-05-24	2.4	27.3	100.0	100.0
2022-05-25	4.1	54.5	100.0	100.0
2022-05-26	6.5	104.0	100.0	100.0
2022-05-27	5.2	71.5	100.0	100.0
2022-05-28	1.4	14.3	100.0	100.0
2022-05-29	5.6	57.5	100.0	100.0
2022-05-30	5.8	88.2	100.0	100.0
2022-05-31	3.2	25.2	100.0	100.0
2022-06-01	1.1	4.7	100.0	100.0
2022-06-02	2.0	20.2	100.0	100.0
2022-06-03	3.5	56.8	100.0	100.0
2022-06-04	1.8	32.5	100.0	100.0
2022-06-05	4.3	68.2	100.0	100.0
2022-06-06	4.5	63.9	100.0	100.0
2022-06-07	10.1	178.2	100.0	100.0
2022-06-08	4.5	62.4	100.0	100.0
2022-06-09	3.9	30.5	100.0	100.0
2022-06-10	3.9	47.5	100.0	100.0
2022-06-11	2.7	21.2	100.0	100.0
2022-06-12	5.1	67.9	100.0	100.0
2022-06-13	8.6	127.7	100.0	100.0
2022-06-14	3.5	52.9	100.0	100.0
2022-06-15	4.8	87.1	100.0	100.0
2022-06-16	2.0	25.9	100.0	100.0

(continued)

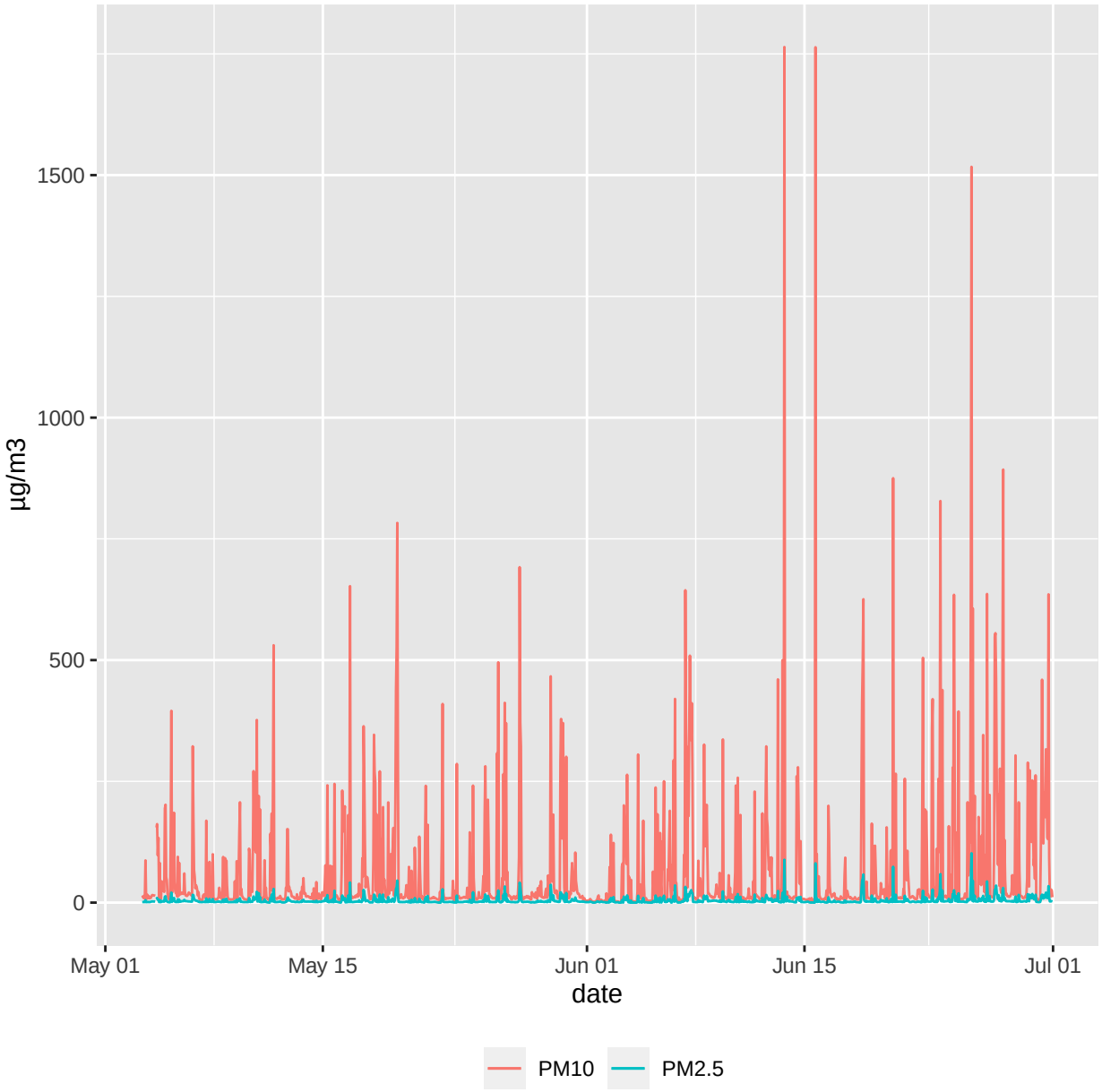
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-06-17	1.4	15.6	100.0	100.0
2022-06-18	8.6	82.4	100.0	100.0
2022-06-19	3.5	35.6	100.0	100.0
2022-06-20	6.4	76.2	100.0	100.0
2022-06-21	3.0	34.7	100.0	100.0
2022-06-22	3.8	62.4	100.0	100.0
2022-06-23	8.7	128.2	100.0	100.0
2022-06-24	6.7	99.0	100.0	100.0
2022-06-25	11.5	163.2	100.0	100.0
2022-06-26	7.0	97.0	100.0	100.0
2022-06-27	10.9	187.1	100.0	100.0
2022-06-28	3.6	41.9	100.0	100.0
2022-06-29	7.1	95.1	100.0	100.0
2022-06-30	8.8	145.9	100.0	100.0

Monthly Average

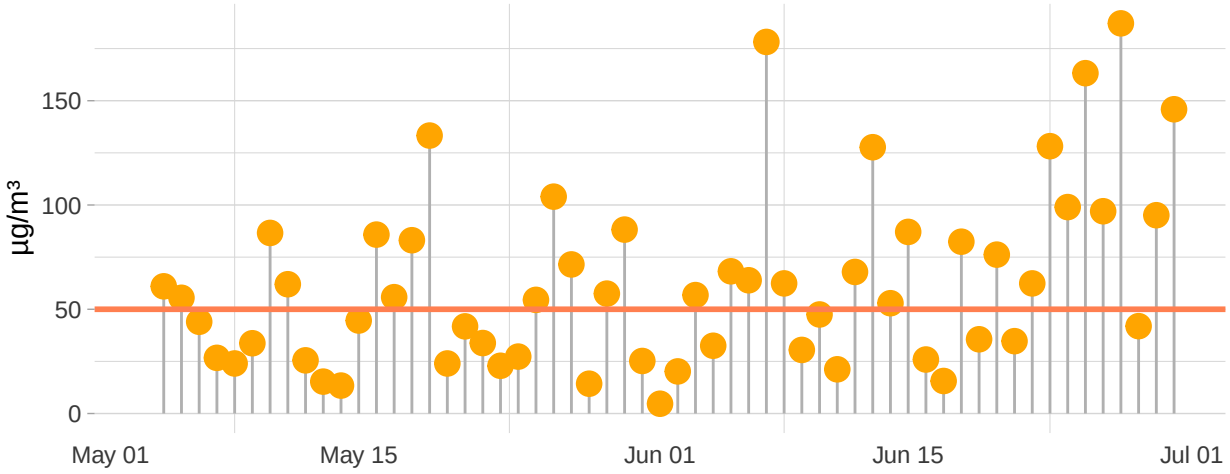
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
May 2022	3.792857	50.54643	98.56207	98.56207
June 2022	5.243333	73.73000	100.00000	100.00000

NA - Not enough data to calculate averages

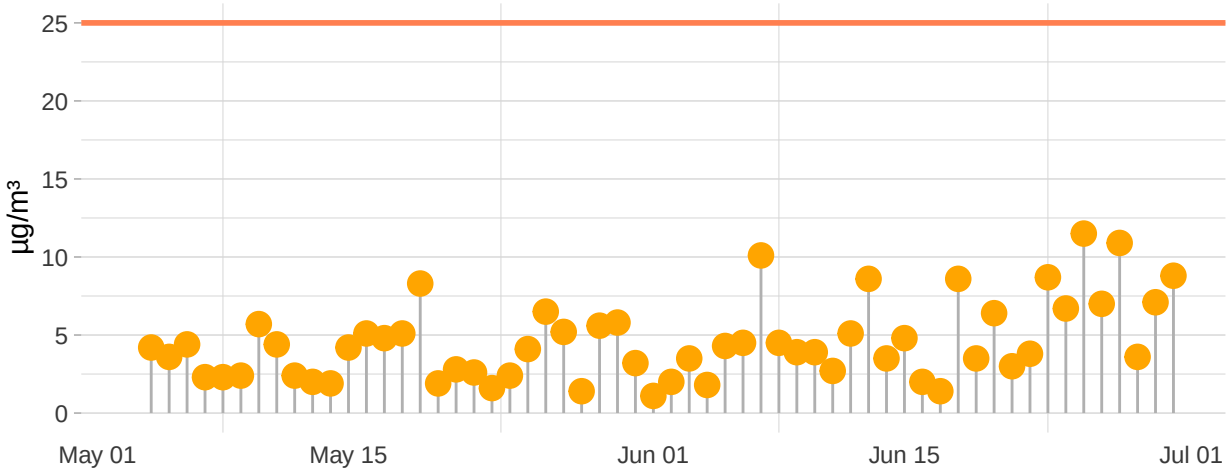
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

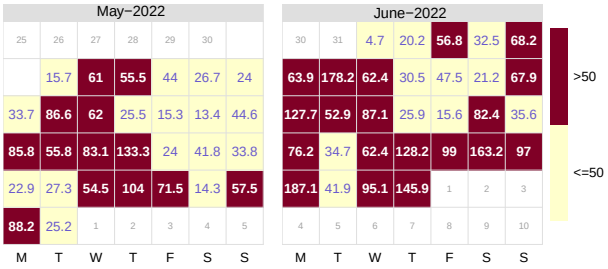


BENNETT RESOURCES

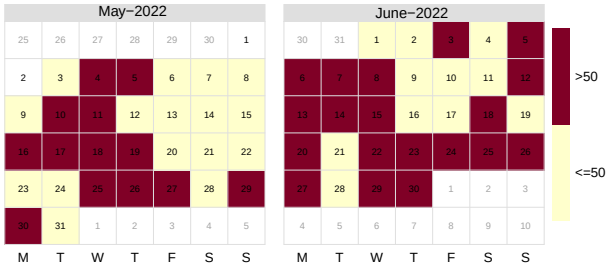
SITE: Ben399
Bi-Monthly Report
May 2022 - June 2022

Daily Exceedances

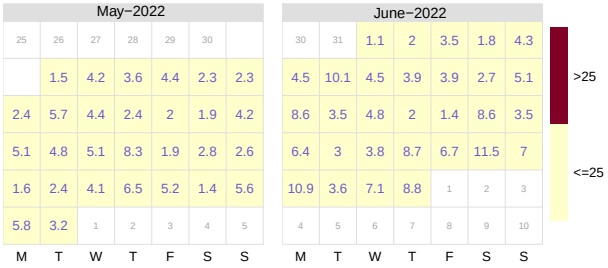
PM$_{10}$. Daily Exceedances at Ben399



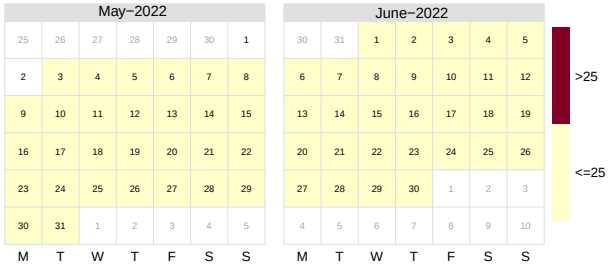
PM$_{10}$. Days with Exceedances at Ben399



PM$_{2.5}$. Daily Exceedances at Ben399



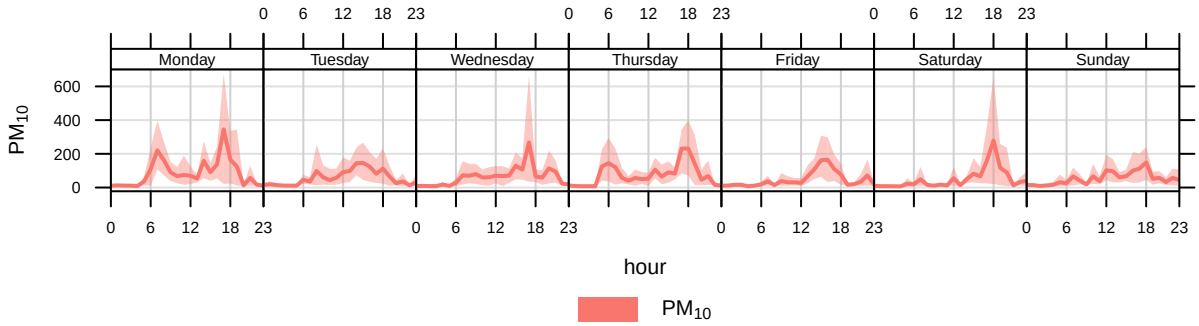
PM$_{2.5}$. Days with Exceedances at Ben399

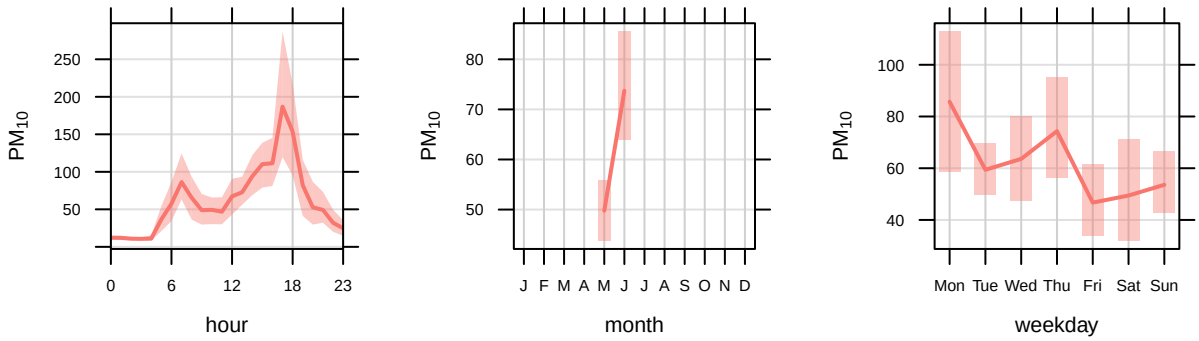


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
May 2022 - June 2022

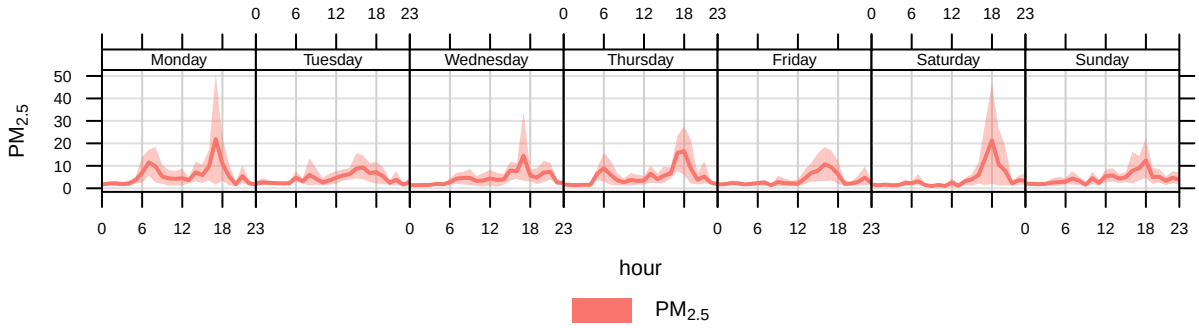
PM_{10} Time variation at Ben399

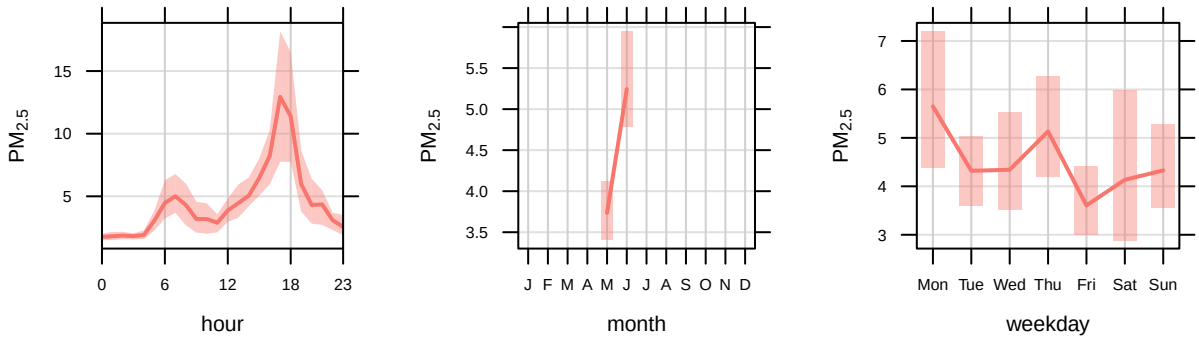




mean and 95% confidence interval in mean

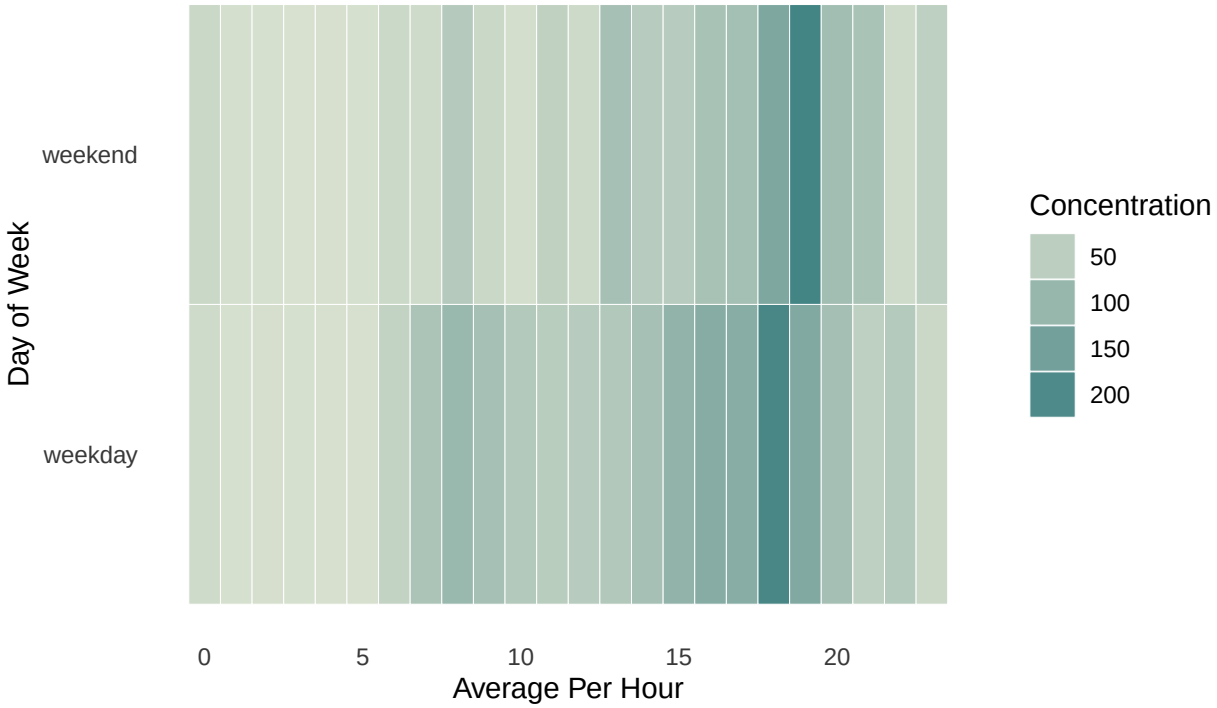
$PM_{2.5}$ Time variation at Ben399



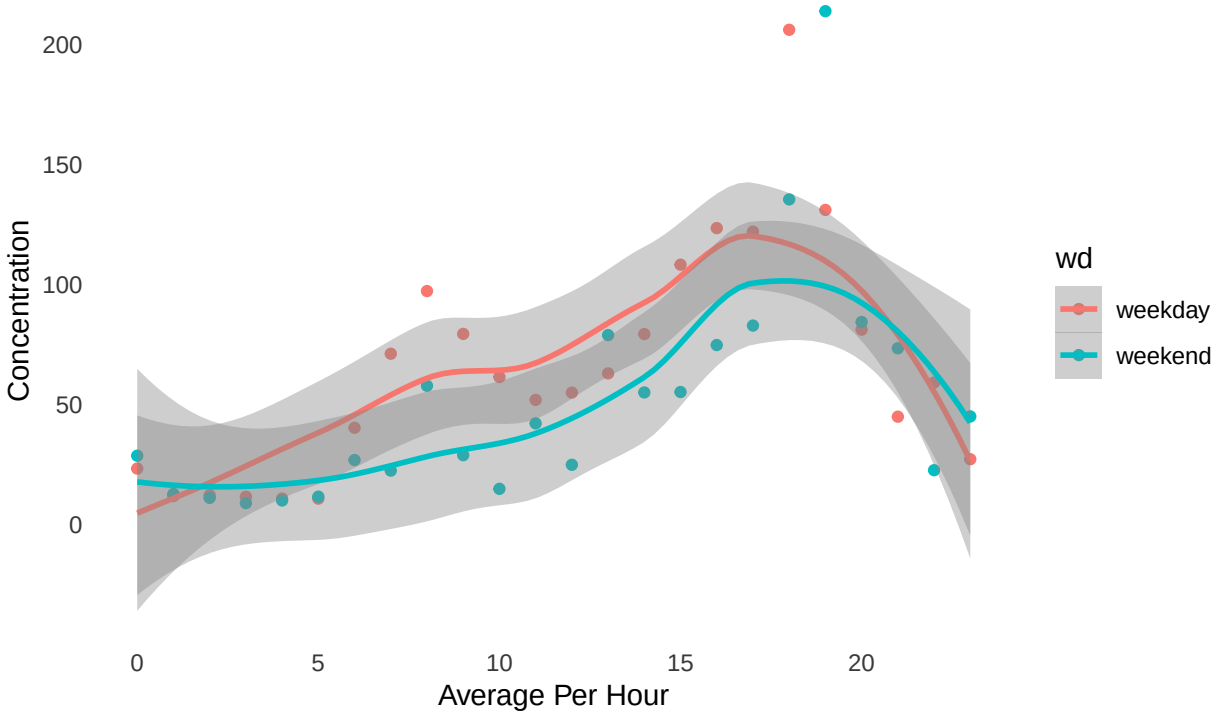


mean and 95% confidence interval in mean

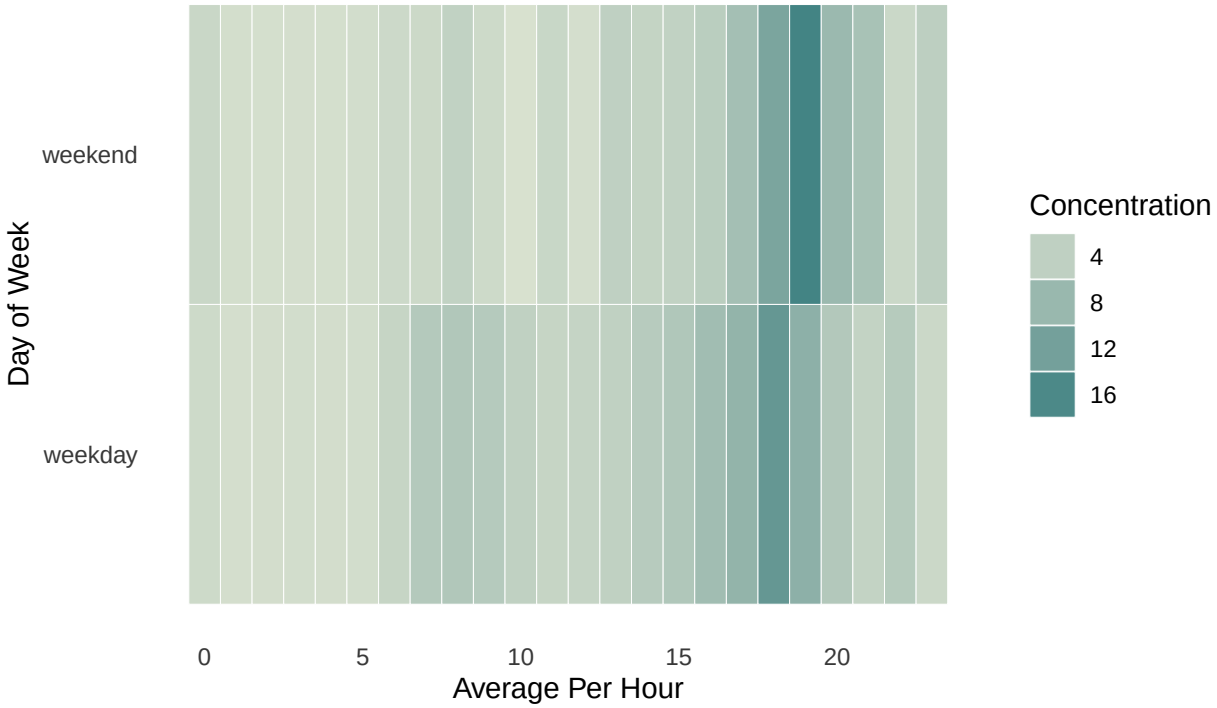
PM10 concentration by Weekday/weekend and Hour



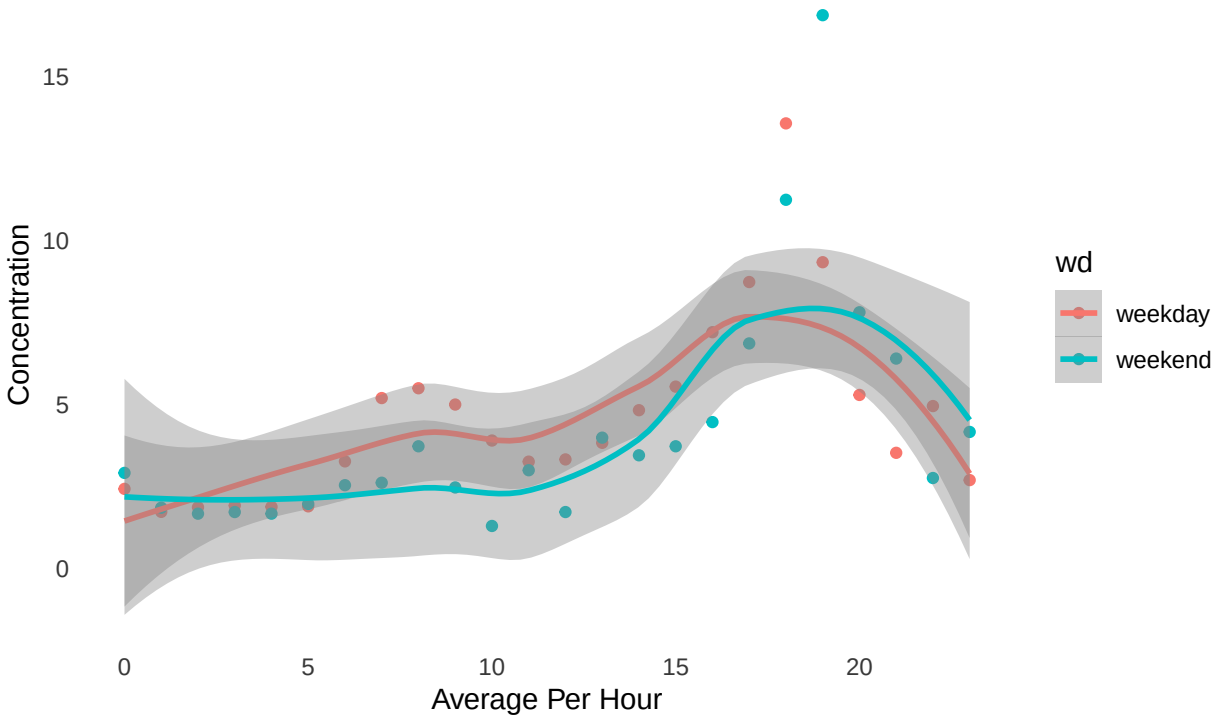
PM10 concentration by weekday and weekend with trend



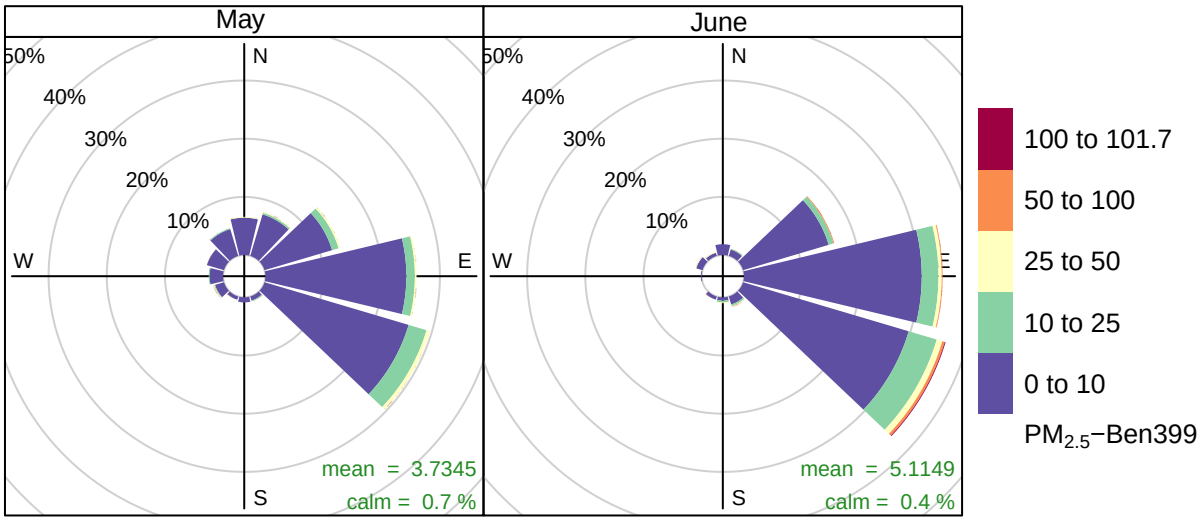
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

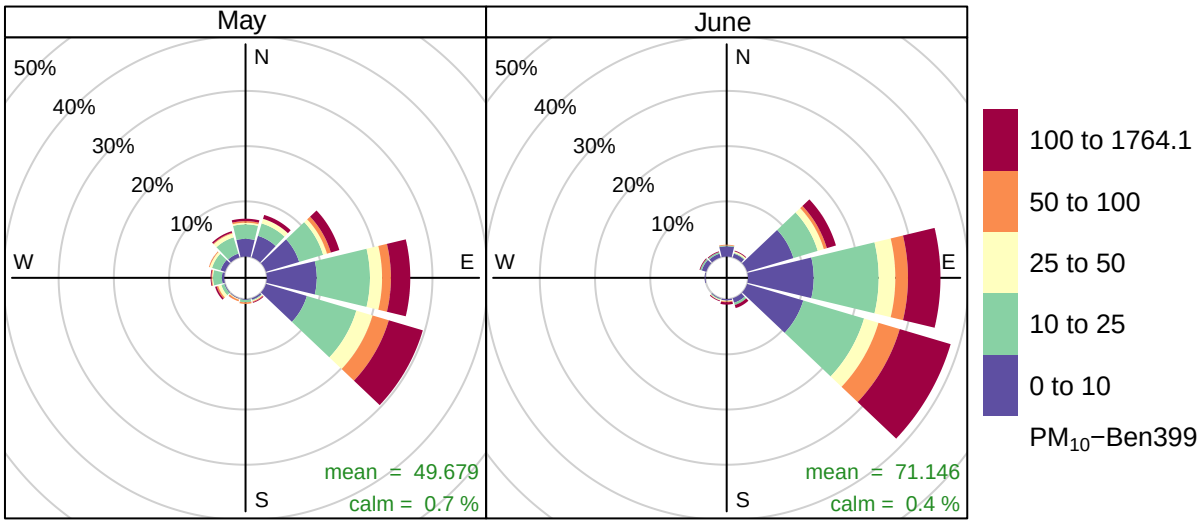


$PM_{2.5}$ pollution rose at Ben399



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

July-August 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
July 2022 - August 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-07-01	13.7	181.2	100.0	100.0
2022-07-02	6.2	74.1	100.0	100.0
2022-07-03	5.0	47.4	100.0	100.0
2022-07-04	6.6	78.5	100.0	100.0
2022-07-05	8.7	105.7	91.7	91.7
2022-07-06	4.2	40.2	100.0	100.0
2022-07-07	7.0	83.0	100.0	100.0
2022-07-08	11.4	164.5	100.0	100.0
2022-07-09	9.2	131.9	100.0	100.0
2022-07-10	13.5	158.6	100.0	100.0
2022-07-11	9.2	106.2	100.0	100.0
2022-07-12	8.2	91.7	100.0	100.0
2022-07-13	5.6	63.3	100.0	100.0
2022-07-14	3.0	22.1	100.0	100.0
2022-07-15	18.0	250.5	100.0	100.0
2022-07-16	3.4	24.1	100.0	100.0
2022-07-17	7.4	73.6	100.0	100.0
2022-07-18	7.5	55.7	100.0	100.0
2022-07-19	7.1	60.3	100.0	100.0
2022-07-20	8.5	80.9	100.0	100.0
2022-07-21	5.0	41.8	100.0	100.0
2022-07-22	14.1	149.0	100.0	100.0
2022-07-23	9.9	104.6	100.0	100.0
2022-07-24	13.8	154.0	100.0	100.0
2022-07-25	6.3	85.7	100.0	100.0
2022-07-26	4.6	67.4	100.0	100.0
2022-07-27	10.4	143.8	100.0	100.0
2022-07-28	7.5	90.6	100.0	100.0
2022-07-29	6.8	67.6	100.0	100.0
2022-07-30	22.5	239.1	100.0	100.0
2022-07-31	8.4	78.0	100.0	100.0
2022-08-01	3.2	24.7	100.0	100.0
2022-08-02	4.6	34.6	95.8	95.8
2022-08-03	4.6	33.9	100.0	100.0
2022-08-04	11.8	111.0	100.0	100.0
2022-08-05	15.0	198.4	100.0	100.0
2022-08-06	12.6	147.8	100.0	100.0
2022-08-07	7.2	75.8	100.0	100.0
2022-08-08	14.0	152.8	100.0	100.0
2022-08-09	9.1	90.9	100.0	100.0
2022-08-10	16.4	232.3	100.0	100.0
2022-08-11	11.1	134.0	100.0	100.0
2022-08-12	6.8	97.0	100.0	100.0
2022-08-13	7.3	90.0	100.0	100.0
2022-08-14	2.7	29.8	100.0	100.0

(continued)

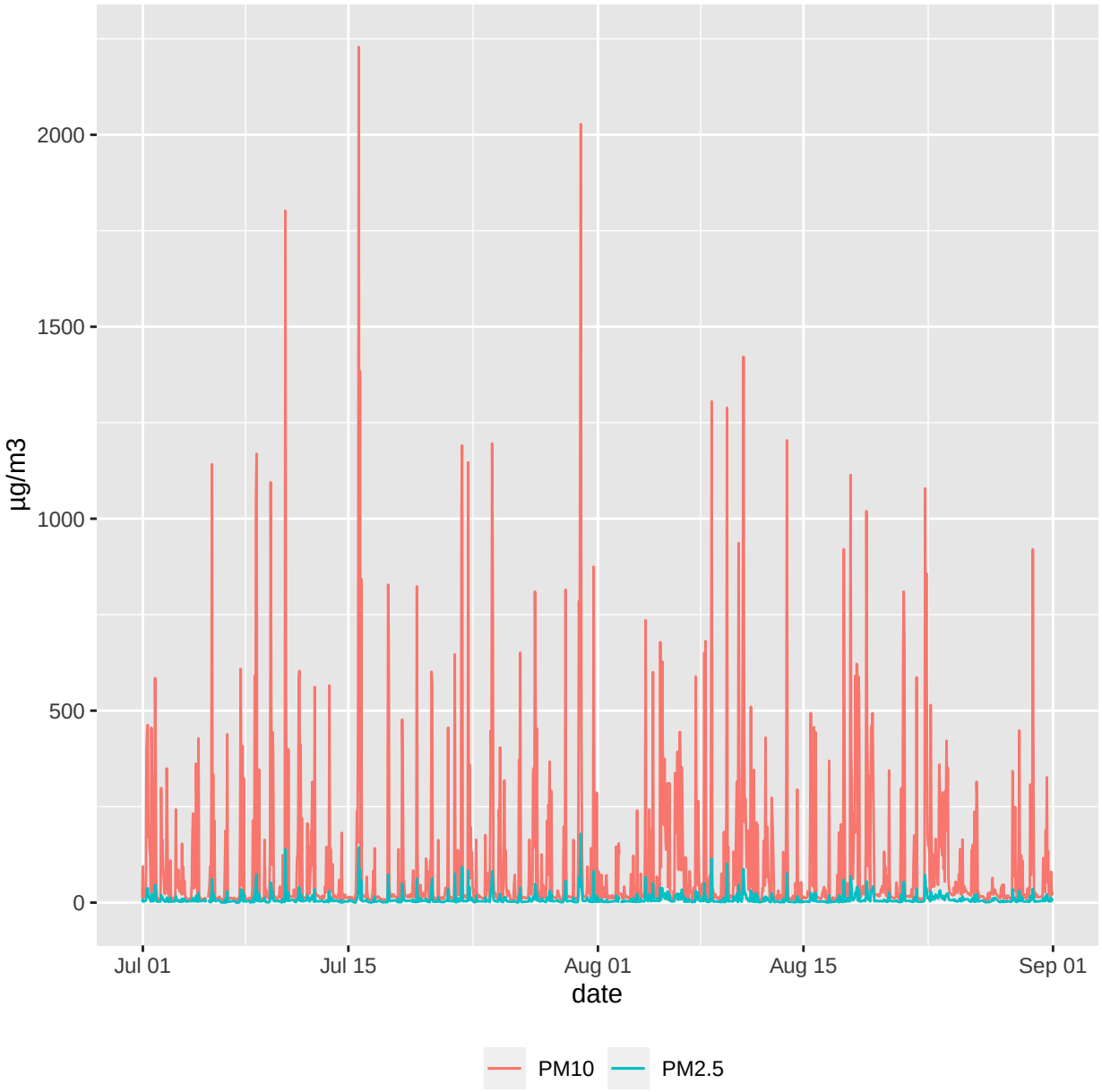
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-08-15	7.3	103.5	100.0	100.0
2022-08-16	2.6	29.8	100.0	100.0
2022-08-17	7.8	94.8	100.0	100.0
2022-08-18	18.6	251.1	100.0	100.0
2022-08-19	16.1	210.3	100.0	100.0
2022-08-20	5.4	50.8	100.0	100.0
2022-08-21	9.8	122.1	100.0	100.0
2022-08-22	5.5	58.3	100.0	100.0
2022-08-23	15.5	199.0	100.0	100.0
2022-08-24	16.2	171.3	100.0	100.0
2022-08-25	6.0	41.5	100.0	100.0
2022-08-26	7.8	69.2	100.0	100.0
2022-08-27	3.5	18.2	100.0	100.0
2022-08-28	4.6	21.6	100.0	100.0
2022-08-29	8.2	88.9	100.0	100.0
2022-08-30	6.6	93.0	100.0	100.0
2022-08-31	6.8	56.7	100.0	100.0

Monthly Average

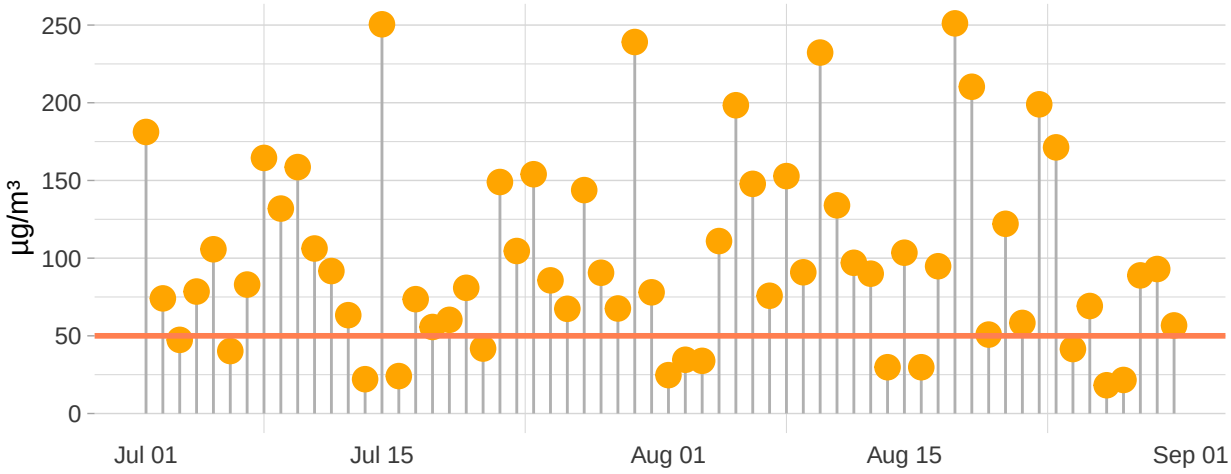
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
July 2022	8.796774	100.4871	99.73226	99.73226
August 2022	8.861290	101.0677	99.86452	99.86452

NA - Not enough data to calculate averages

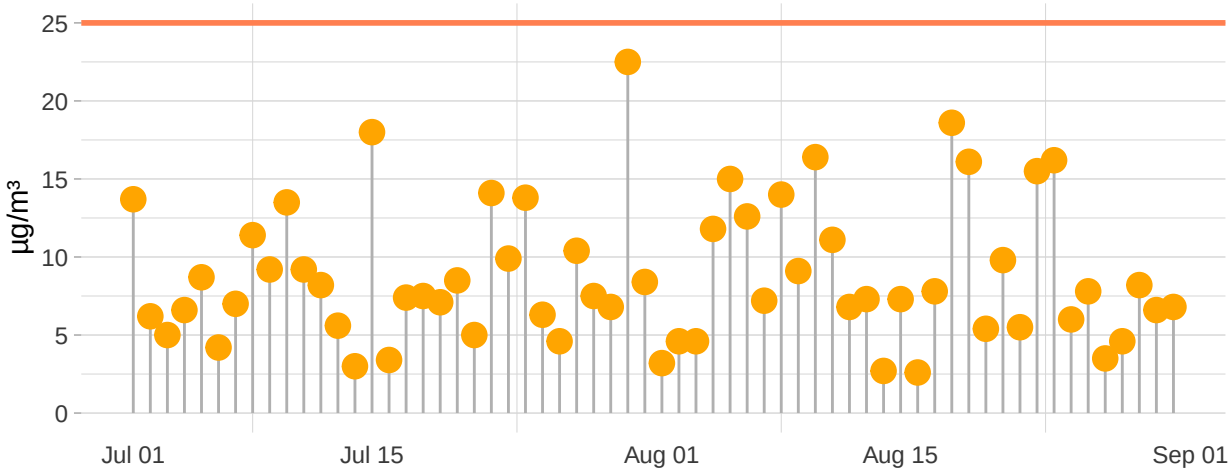
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

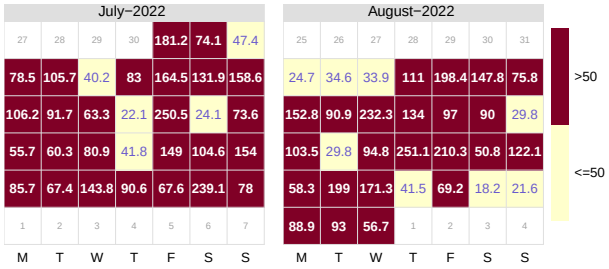


BENNETT RESOURCES

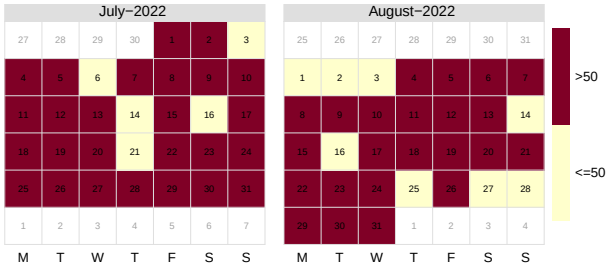
SITE: Ben399
Bi-Monthly Report
July 2022 - August 2022

Daily Exceedances

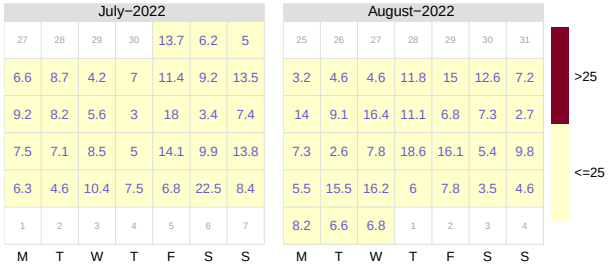
PM$_{10}$. Daily Exceedances at Ben399



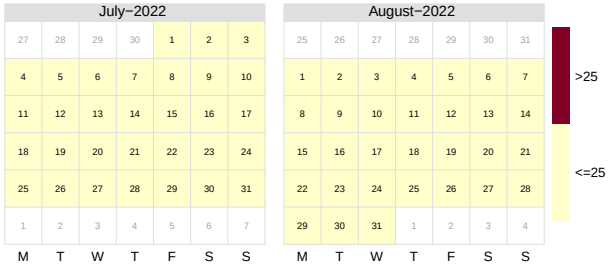
PM$_{10}$. Days with Exceedances at Ben399



PM$_{2.5}$. Daily Exceedances at Ben399



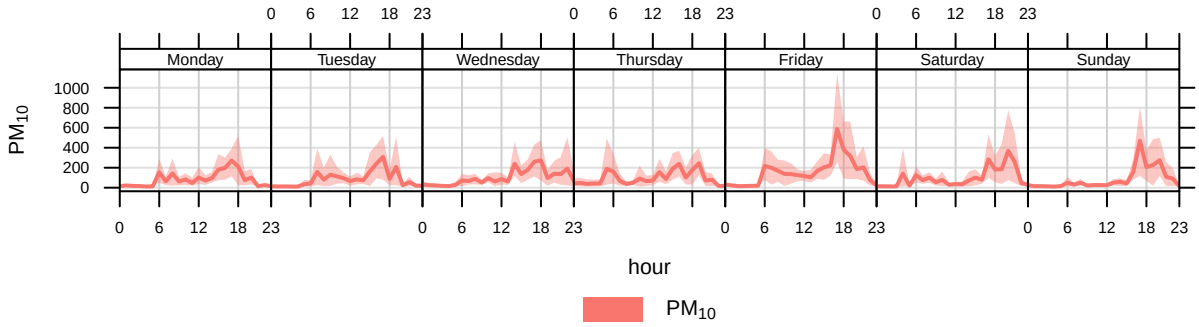
PM$_{2.5}$. Days with Exceedances at Ben399

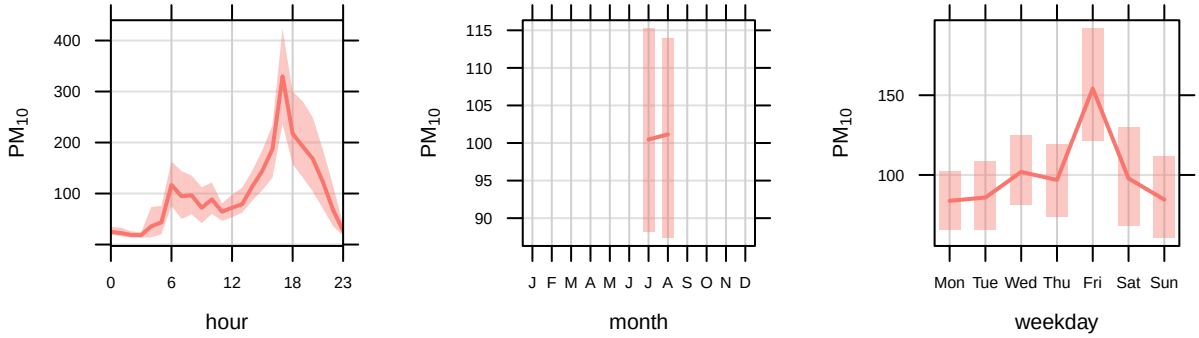


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
July 2022 - August 2022

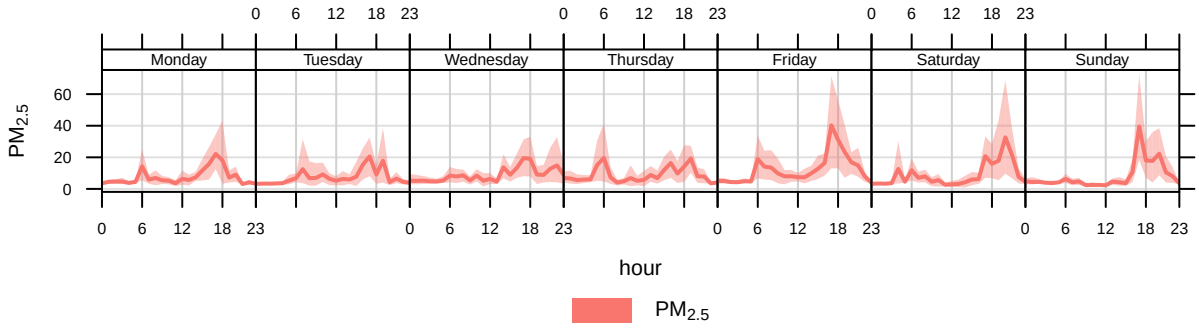
PM_{10} Time variation at Ben399

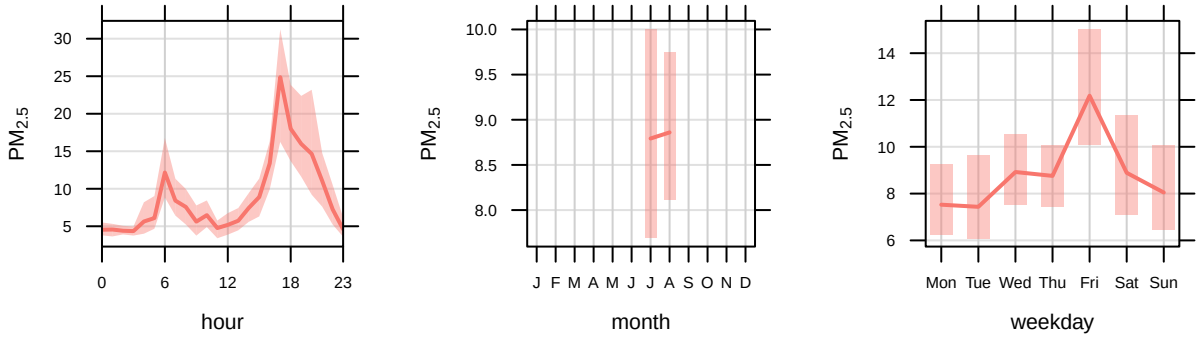




mean and 95% confidence interval in mean

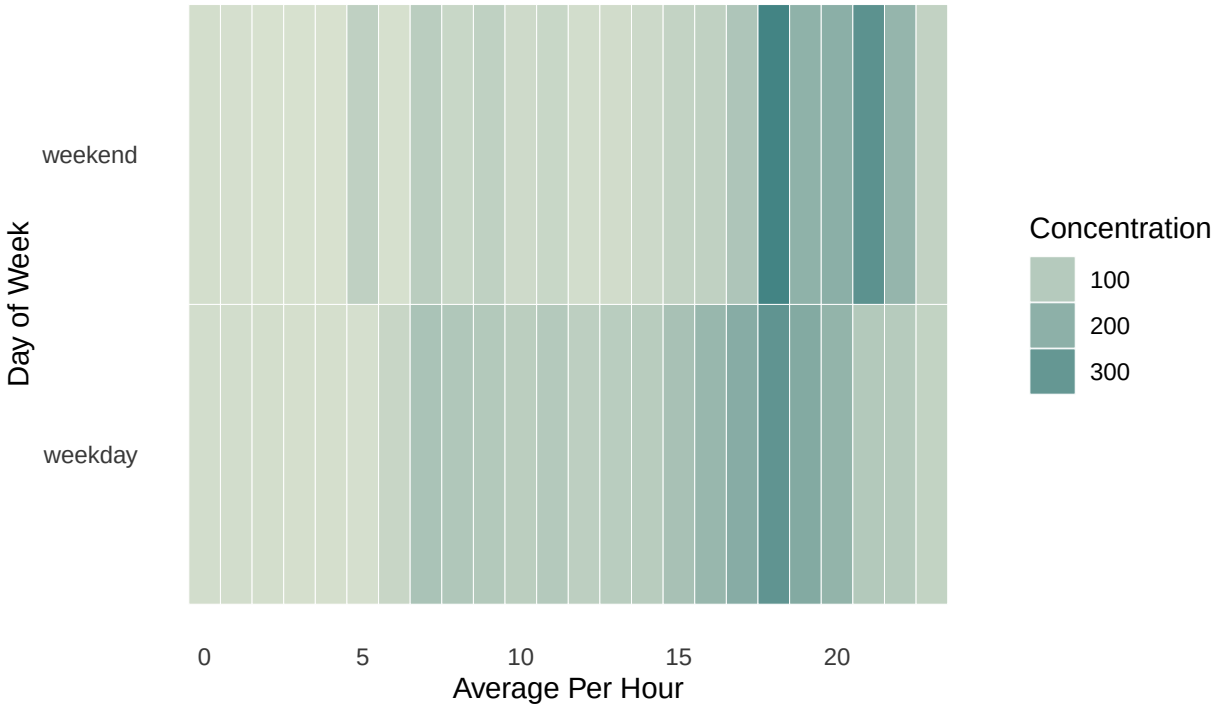
$PM_{2.5}$ Time variation at Ben399



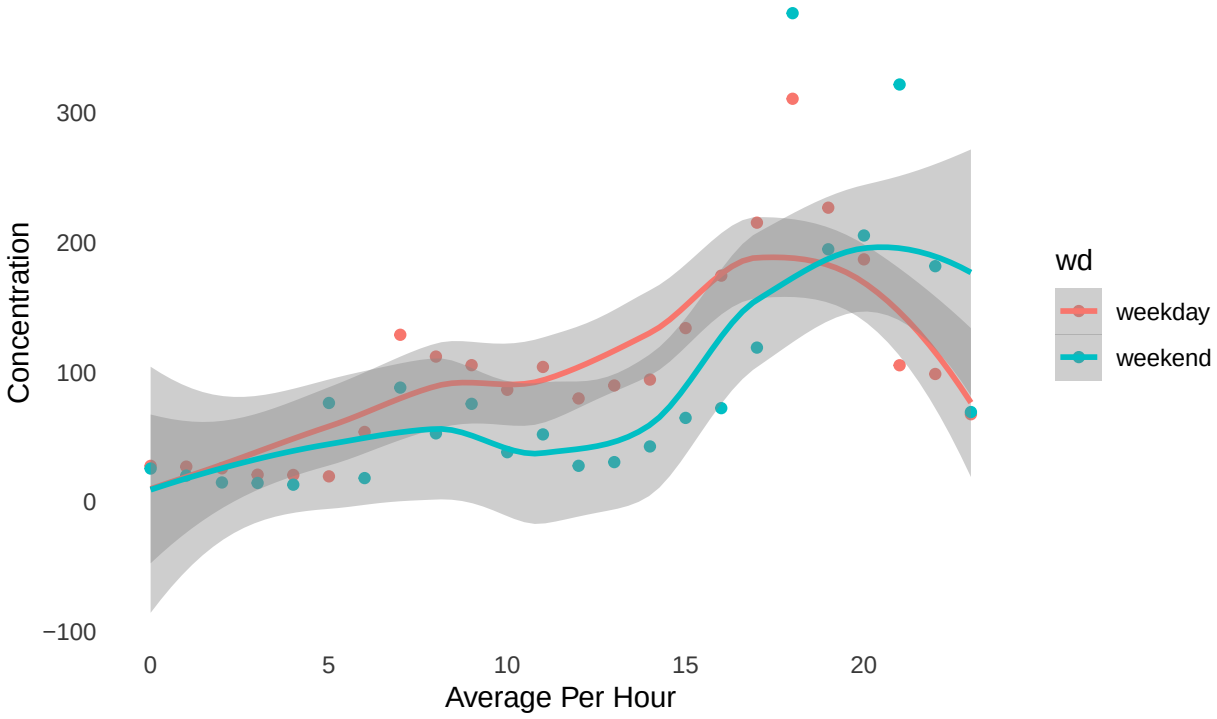


mean and 95% confidence interval in mean

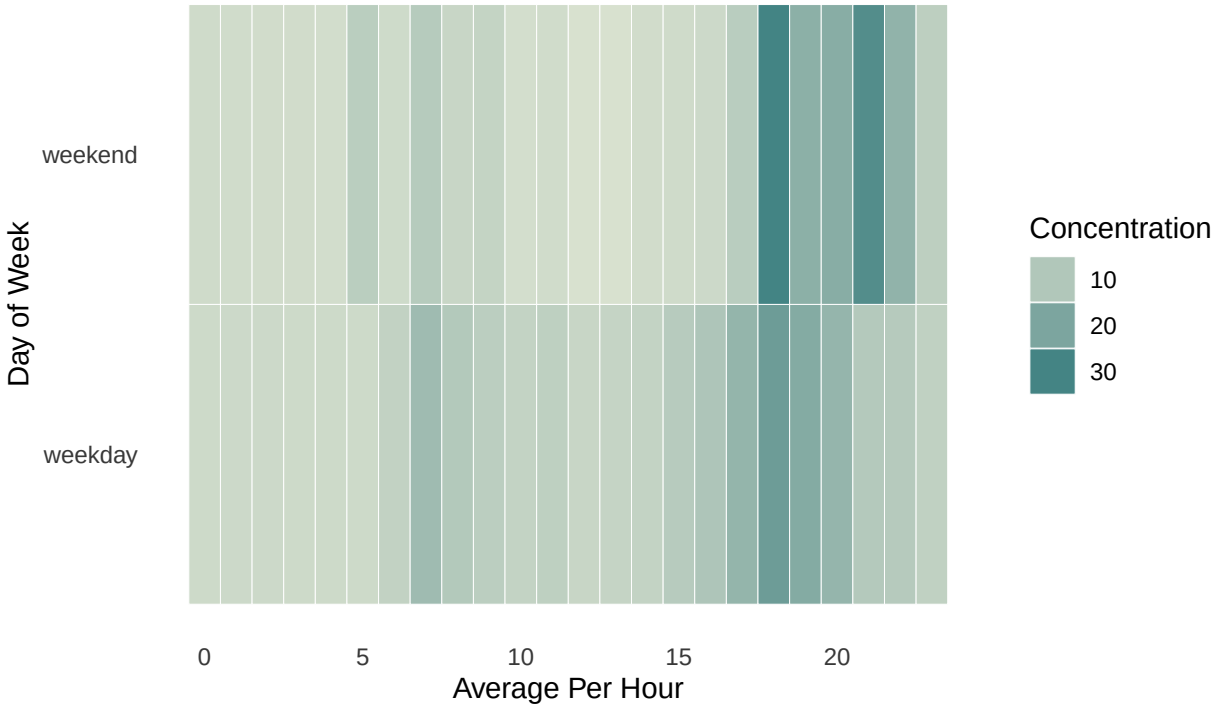
PM10 concentration by Weekday/weekend and Hour



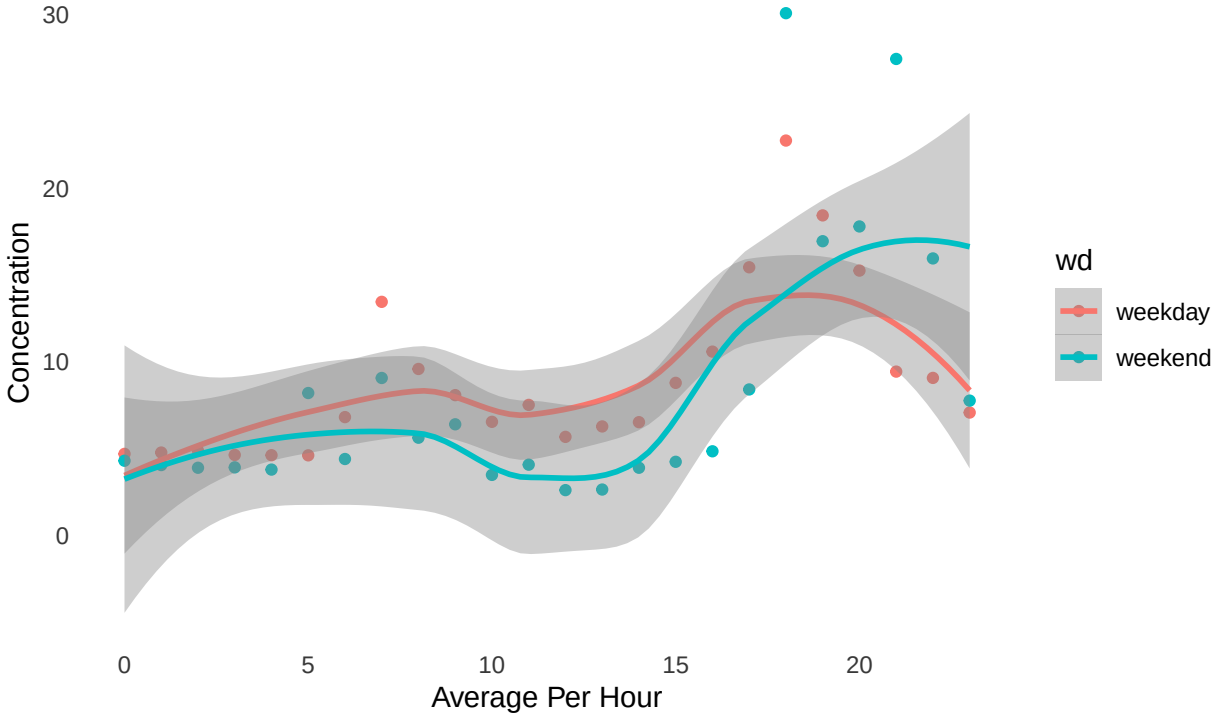
PM10 concentration by weekday and weekend with trend



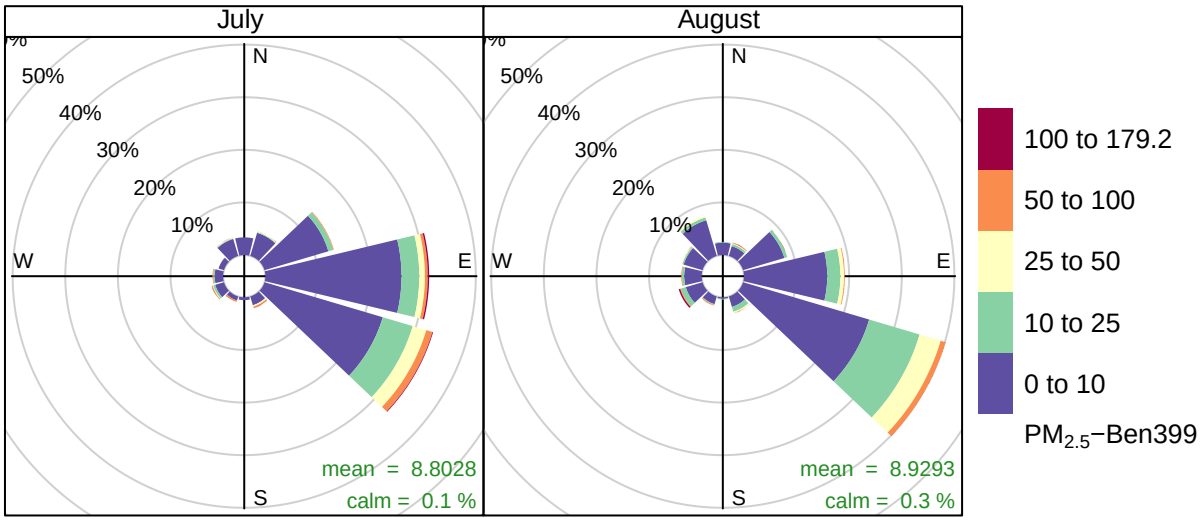
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

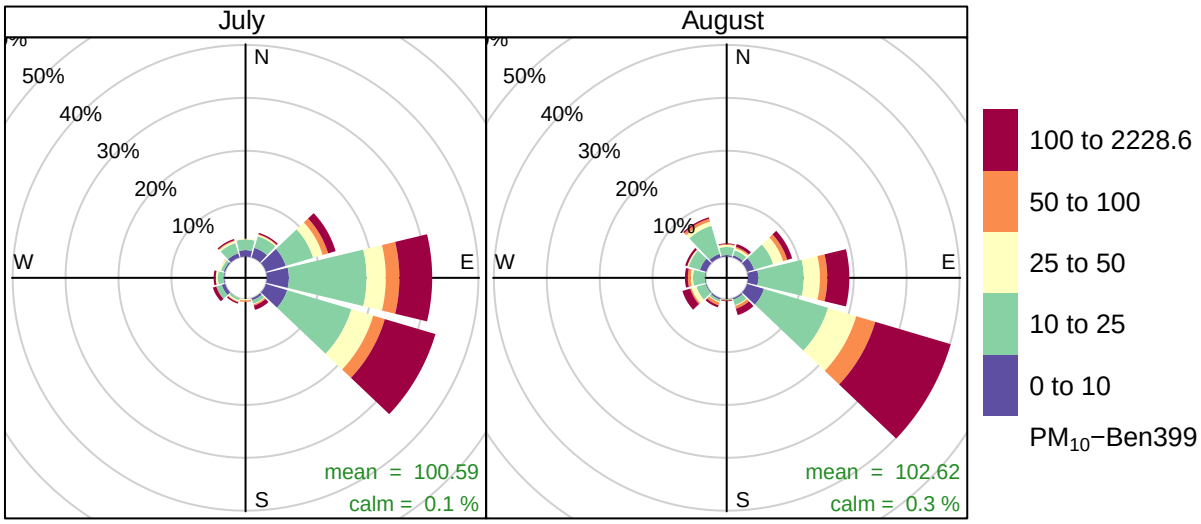


$PM_{2.5}$ pollution rose at Ben399



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

September-October 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
September 2022 - October 2022

Daily Averages

	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-09-01	11.5	124.8	100.0	100.0
2022-09-02	5.2	61.8	100.0	100.0
2022-09-03	1.8	13.7	100.0	100.0
2022-09-04	5.9	43.6	100.0	100.0
2022-09-05	5.0	38.8	100.0	100.0
2022-09-06	5.7	37.4	95.8	95.8
2022-09-07	9.3	67.8	100.0	100.0
2022-09-08	6.2	75.1	100.0	100.0
2022-09-09	3.9	25.5	100.0	100.0
2022-09-10	9.0	62.4	100.0	100.0
2022-09-11	7.0	64.4	100.0	100.0
2022-09-12	5.6	39.8	100.0	100.0
2022-09-13	12.5	126.2	100.0	100.0
2022-09-14	14.6	160.4	100.0	100.0
2022-09-15	11.3	117.4	100.0	100.0
2022-09-16	6.0	57.4	100.0	100.0
2022-09-17	8.9	89.0	100.0	100.0
2022-09-18	13.1	135.3	100.0	100.0
2022-09-19	3.2	20.8	100.0	100.0
2022-09-20	8.9	70.2	100.0	100.0
2022-09-21	7.5	73.1	100.0	100.0
2022-09-22	7.2	80.9	100.0	100.0
2022-09-23	6.8	69.3	100.0	100.0
2022-09-24	5.7	39.9	100.0	100.0
2022-09-25	4.1	19.6	100.0	100.0
2022-09-26	5.3	39.9	100.0	100.0
2022-09-27	3.0	20.1	100.0	100.0
2022-09-28	6.1	50.2	100.0	100.0
2022-09-29	3.4	15.4	100.0	100.0
2022-09-30	2.3	6.0	100.0	100.0
2022-10-01	0.6	2.7	91.7	91.7
2022-10-02	NA	NA	NA	NA
2022-10-03	2.3	6.3	100.0	100.0
2022-10-04	2.0	5.0	100.0	100.0
2022-10-05	1.8	5.6	100.0	100.0
2022-10-06	2.1	10.5	100.0	100.0
2022-10-07	2.3	16.1	100.0	100.0
2022-10-08	1.8	13.1	100.0	100.0
2022-10-09	3.0	25.2	100.0	100.0
2022-10-10	2.6	18.5	100.0	100.0
2022-10-11	1.4	7.1	100.0	100.0
2022-10-12	4.9	13.4	100.0	100.0
2022-10-13	7.0	51.9	100.0	100.0
2022-10-14	4.2	34.2	100.0	100.0
2022-10-15	3.0	20.6	100.0	100.0

(continued)

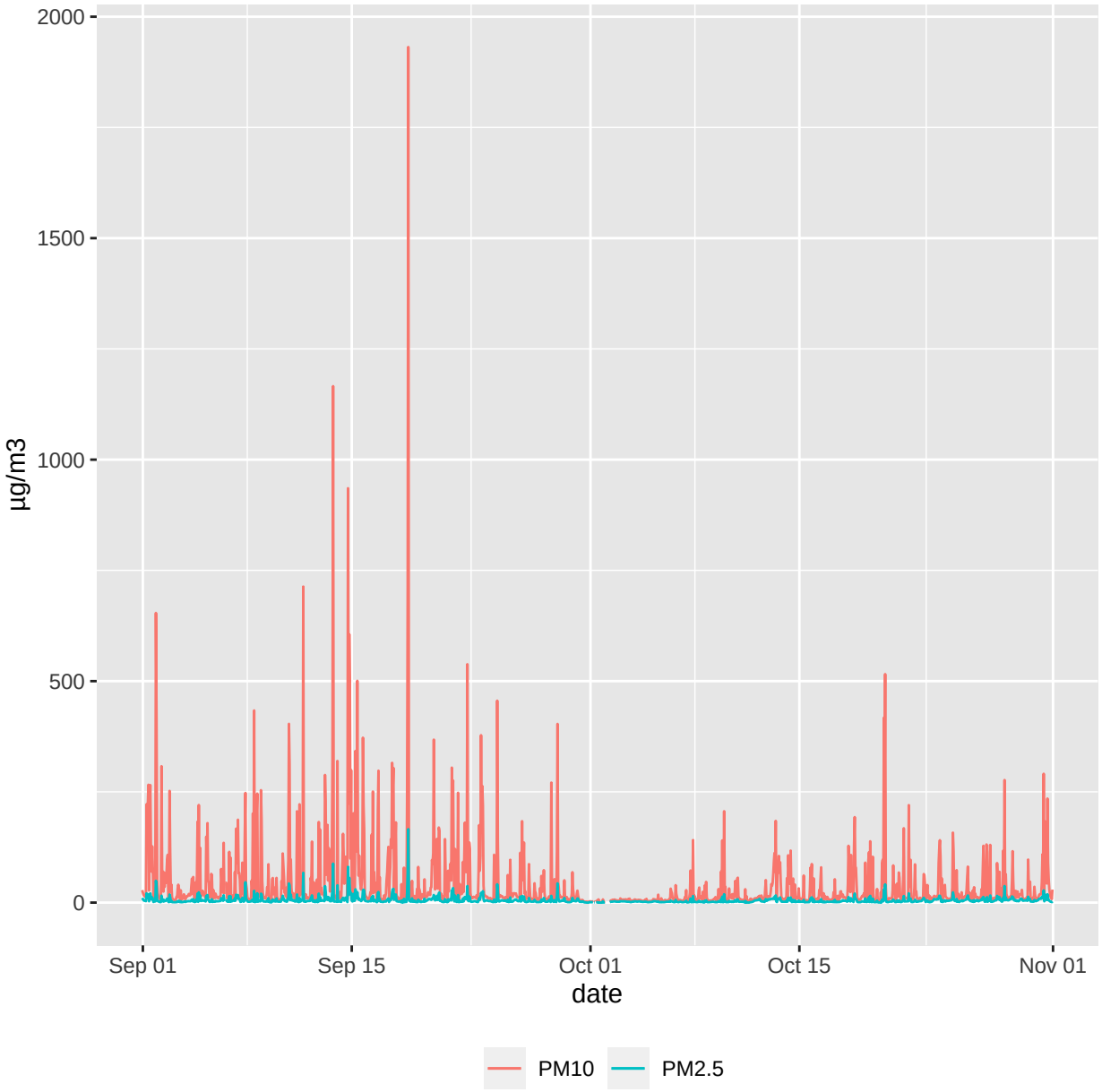
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-10-16	2.1	15.9	100.0	100.0
2022-10-17	2.3	12.7	100.0	100.0
2022-10-18	5.6	48.1	100.0	100.0
2022-10-19	3.7	32.6	100.0	100.0
2022-10-20	5.4	64.0	100.0	100.0
2022-10-21	3.0	24.5	100.0	100.0
2022-10-22	4.5	37.4	100.0	100.0
2022-10-23	3.9	17.8	100.0	100.0
2022-10-24	6.4	33.3	100.0	100.0
2022-10-25	5.6	27.3	100.0	100.0
2022-10-26	5.6	19.8	100.0	100.0
2022-10-27	5.7	37.4	100.0	100.0
2022-10-28	8.2	40.8	100.0	100.0
2022-10-29	6.7	22.1	100.0	100.0
2022-10-30	4.7	17.8	100.0	100.0
2022-10-31	9.0	67.1	100.0	100.0

Monthly Average

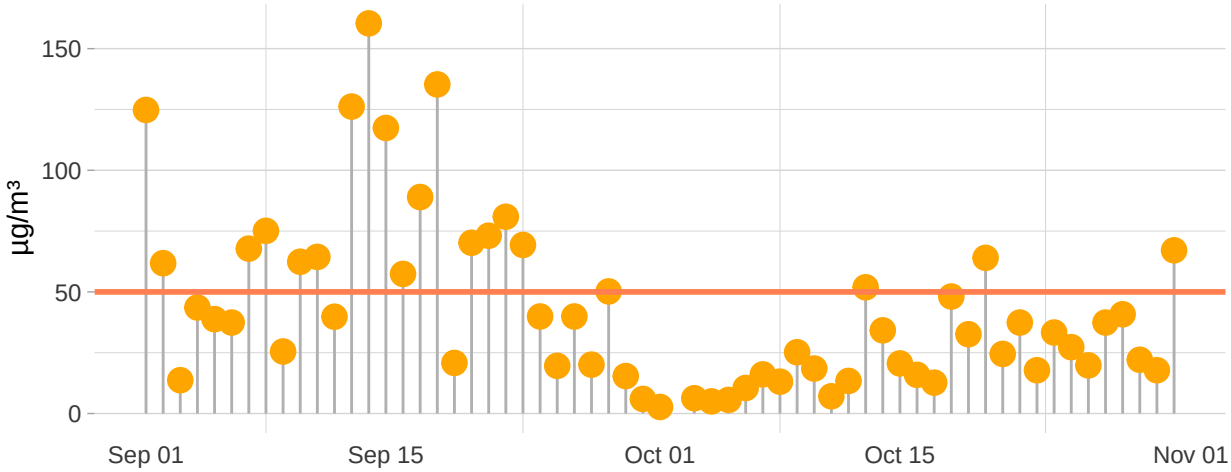
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
September 2022	6.866667	61.54	99.86000	99.86000
October 2022	4.046667	24.96	99.72333	99.72333

NA - Not enough data to calculate averages

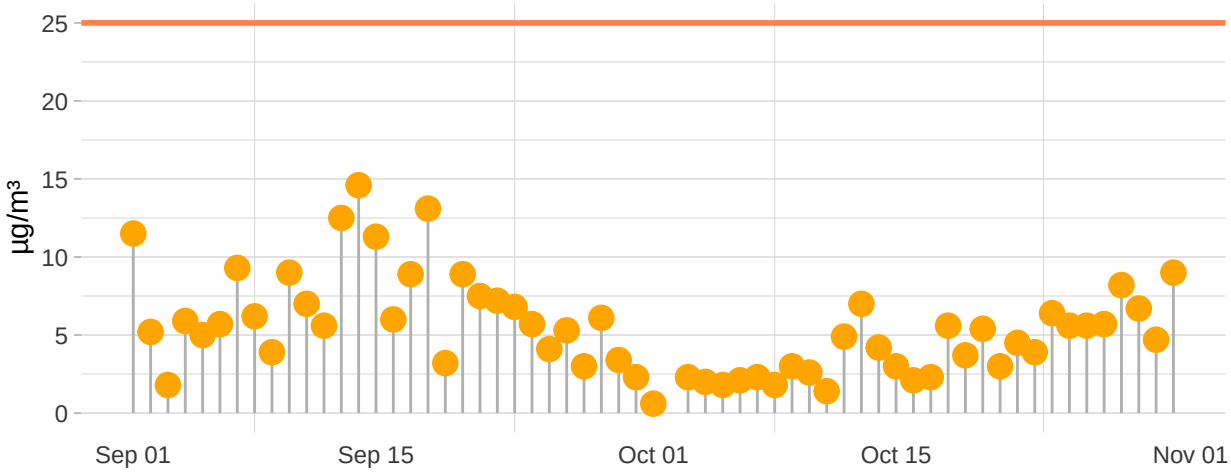
PM10 & PM2.5 hourly averages



PM10 daily averages



PM2.5 daily averages

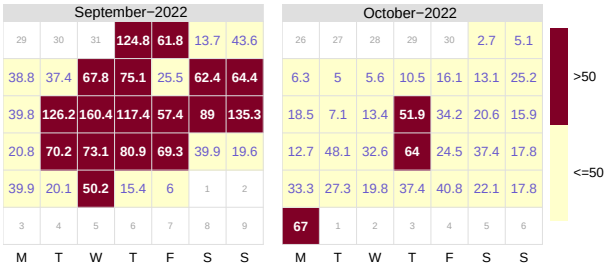


BENNETT RESOURCES

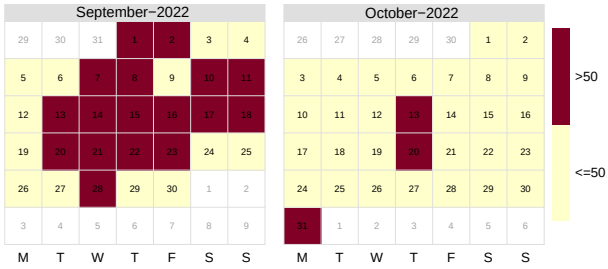
SITE: Ben399
Bi-Monthly Report
September 2022 - October 2022

Daily Exceedances

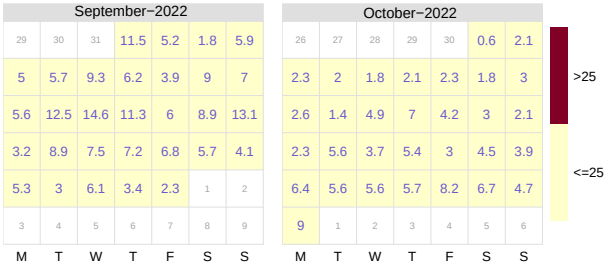
PM$_{10}$. Daily Exceedances at Ben399



PM$_{10}$. Days with Exceedances at Ben399



PM$_{2.5}$. Daily Exceedances at Ben399



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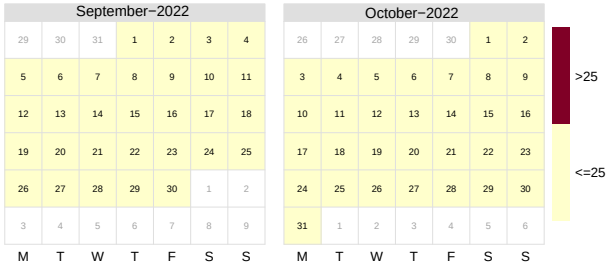
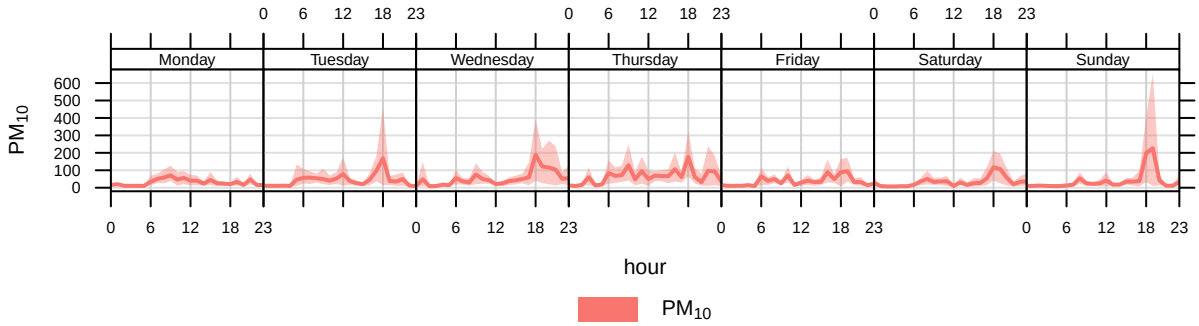
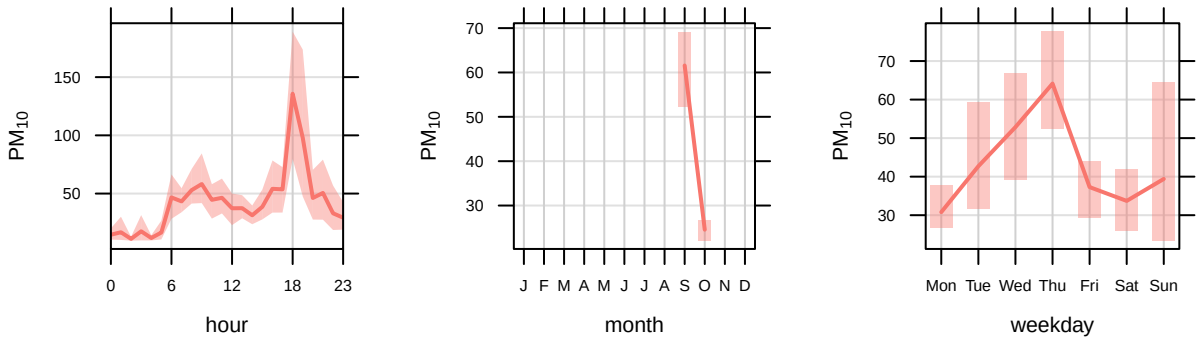


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
September 2022 - October 2022

PM_{10} Time variation at Ben399





mean and 95% confidence interval in mean

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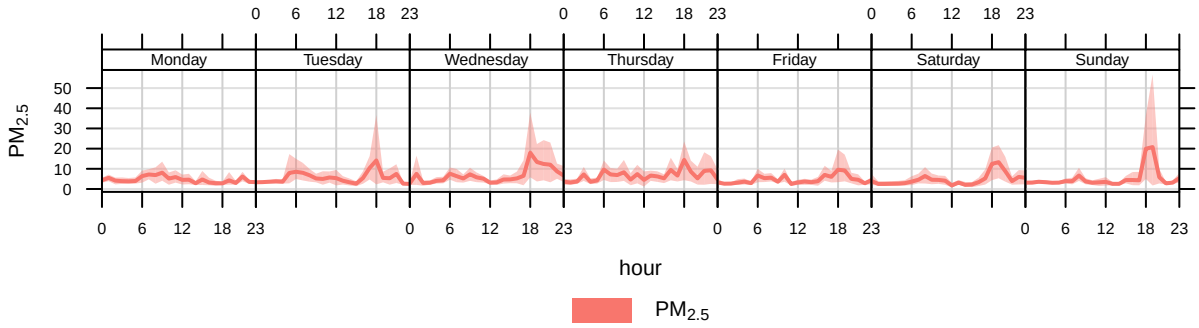

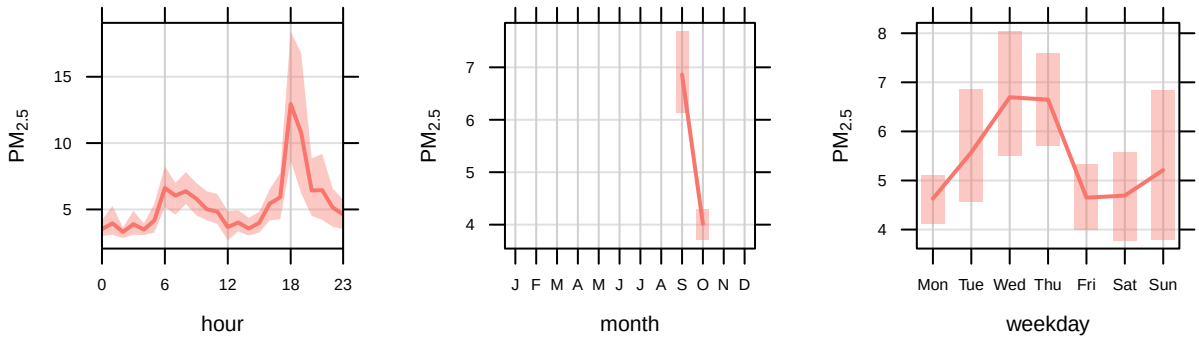

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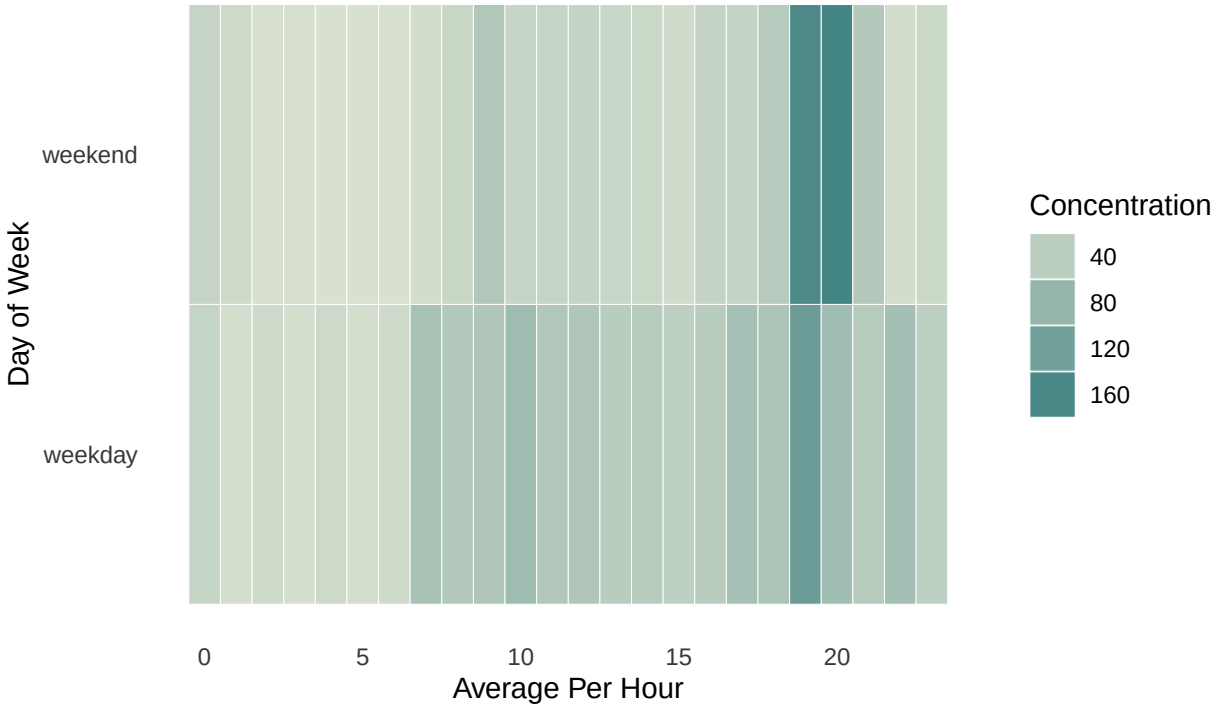
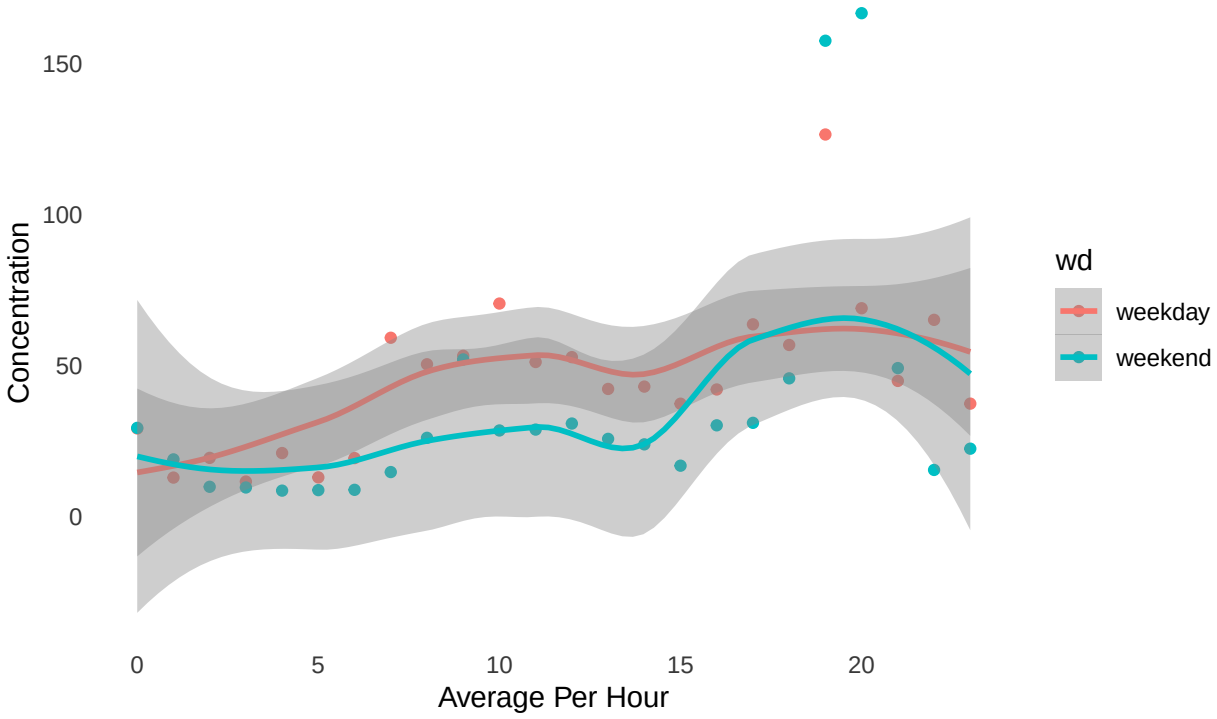
PM10 concentration by Weekday/weekend and Hour



PM10 concentration by weekday and weekend with trend



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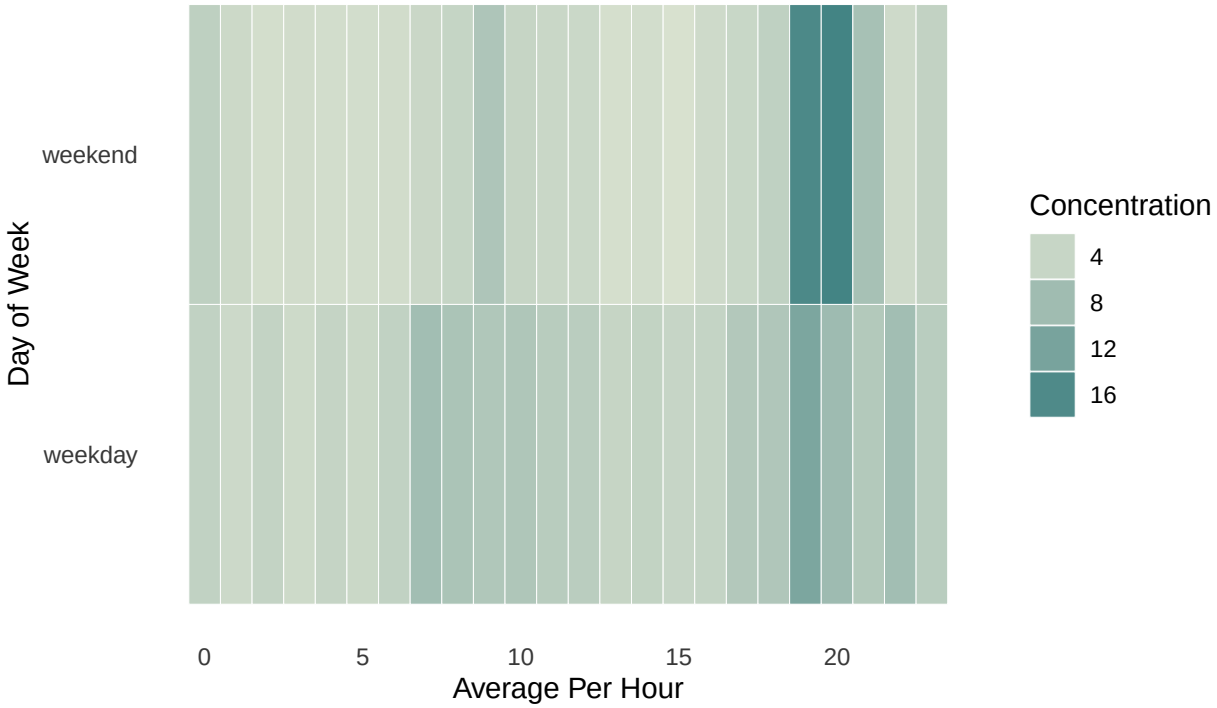

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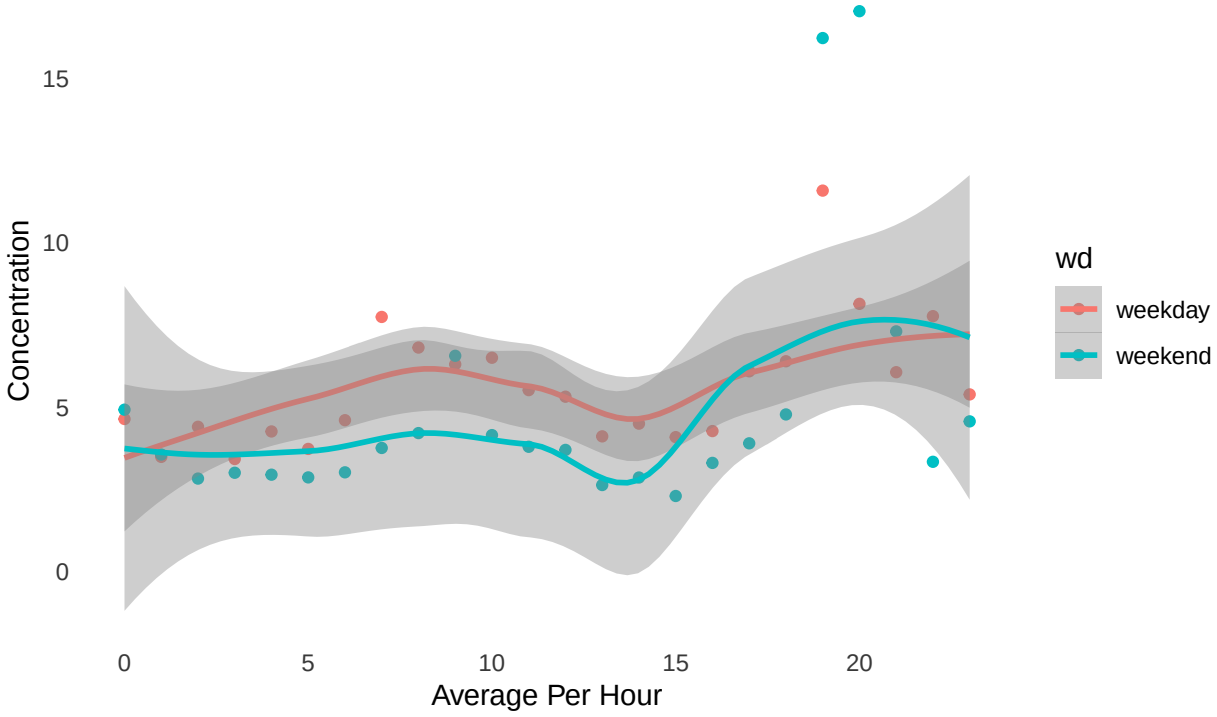

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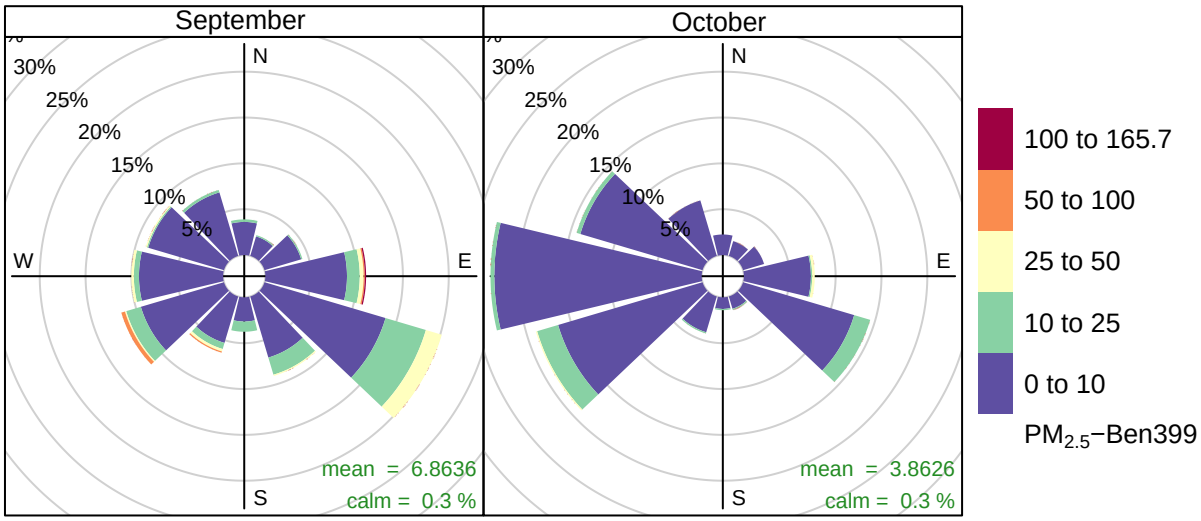
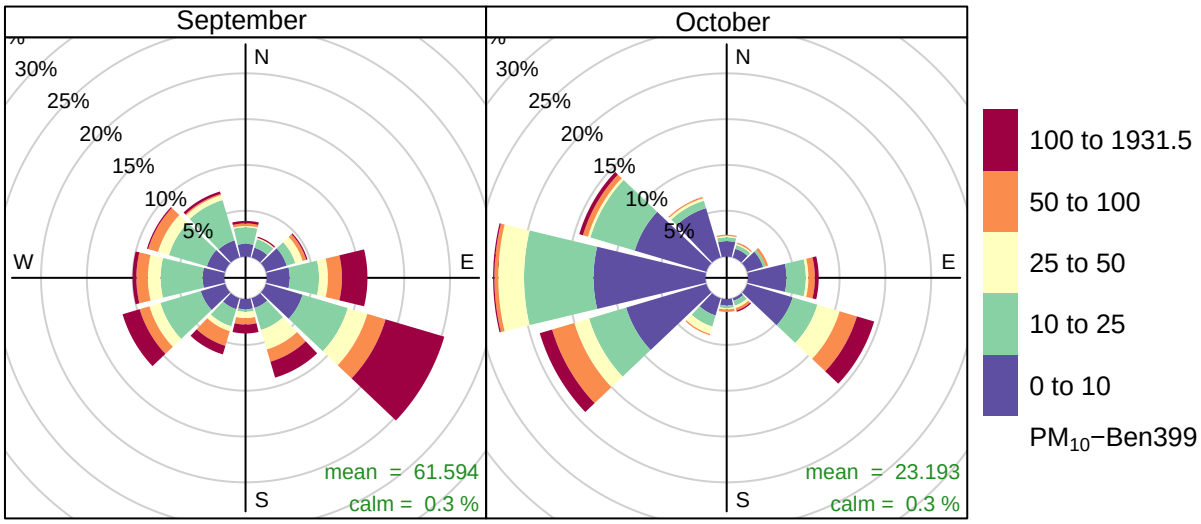


Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Bi-Monthly Air Quality Reports 2022 [BEN399]

November 2022

BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
November 2022 - November 2022

Daily Averages

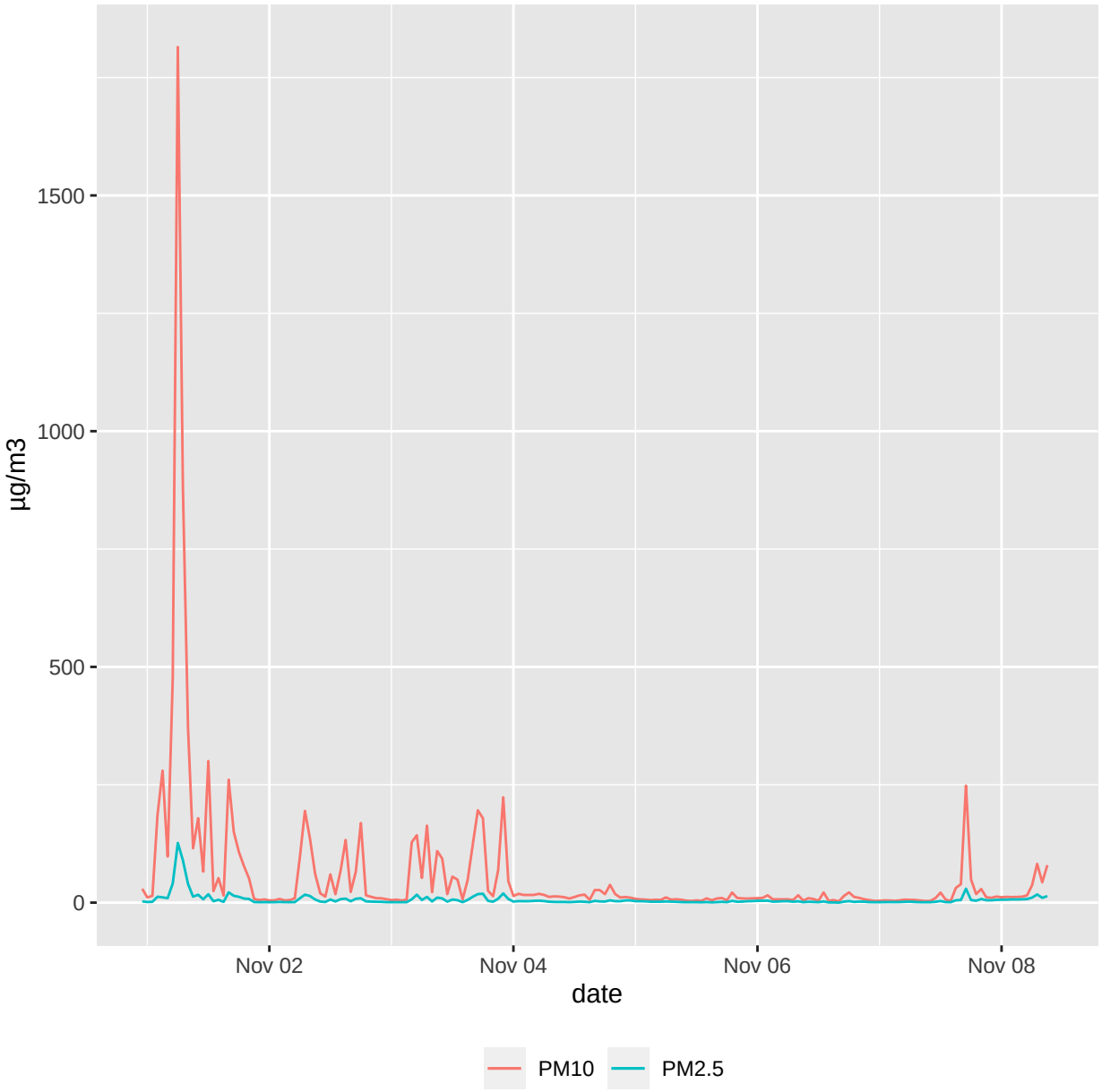
	µg/m³	µg/m³	%	%
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
2022-11-01	19.4	231.2	100.0	100.0
2022-11-02	4.7	47.7	100.0	100.0
2022-11-03	7.5	74.4	100.0	100.0
2022-11-04	2.7	16.1	100.0	100.0
2022-11-05	1.9	7.6	100.0	100.0
2022-11-06	2.1	9.1	100.0	100.0
2022-11-07	4.0	22.6	100.0	100.0
2022-11-08	NA	NA	41.7	41.7

Monthly Average

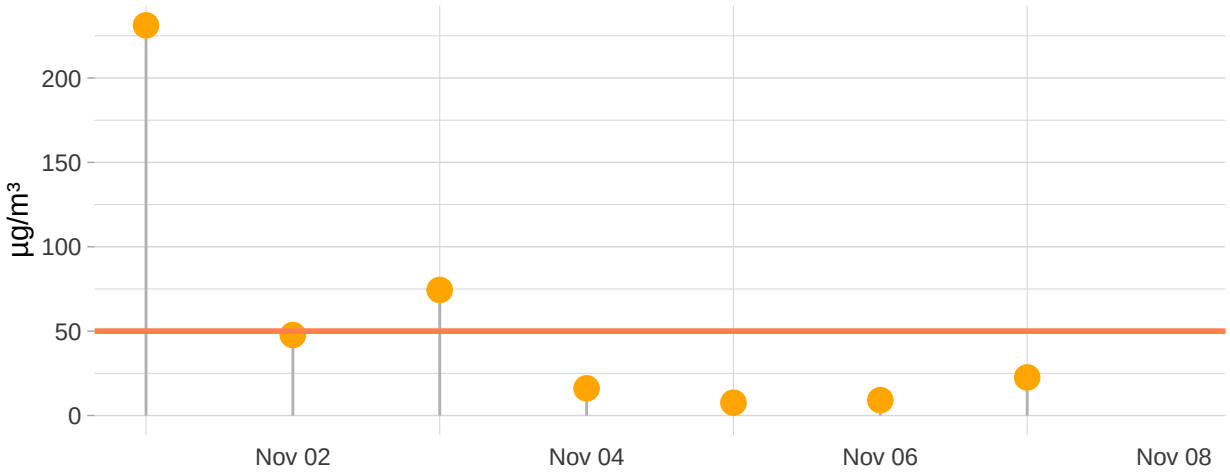
	PM2.5-Ben399	PM10-Ben399	PM2.5 data capture-Ben399	PM10 data capture-Ben399
November 2022	NA	NA	NA	NA

NA - Not enough data to calculate averages

PM10 & PM2.5 hourly averages



PM10 daily averages



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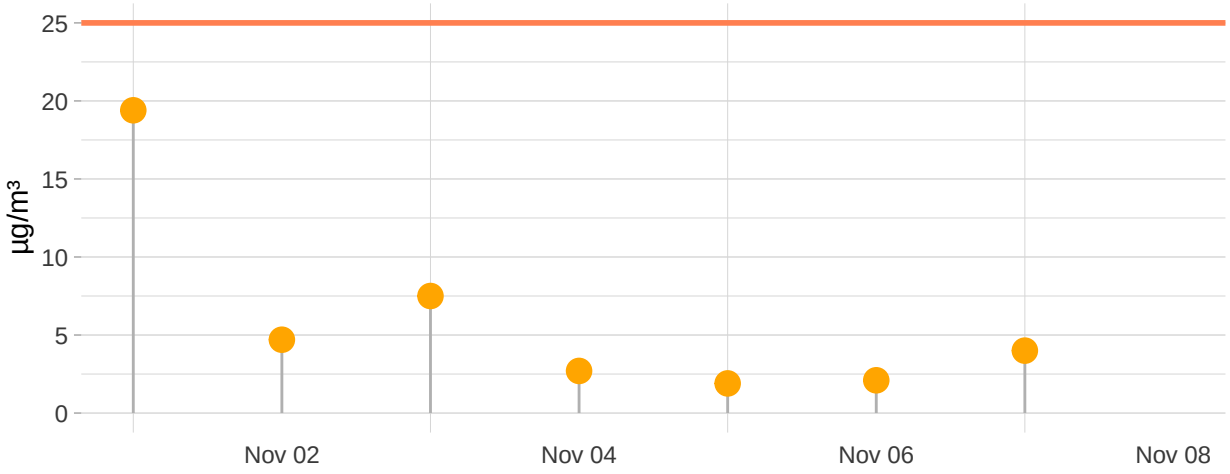
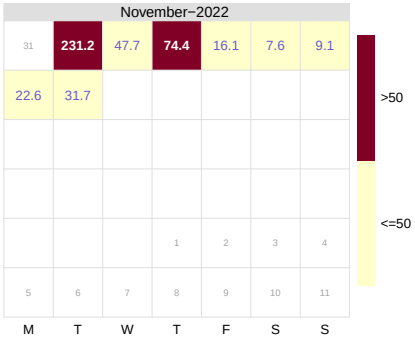


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
November 2022 - November 2022

Daily Exceedances

PM_{10}. Daily Exceedances at Ben399



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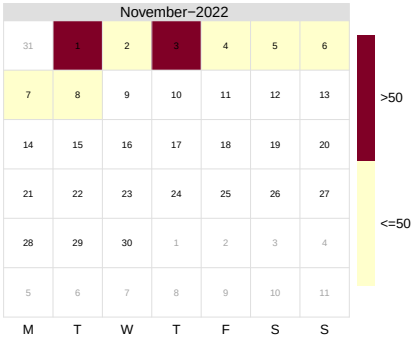

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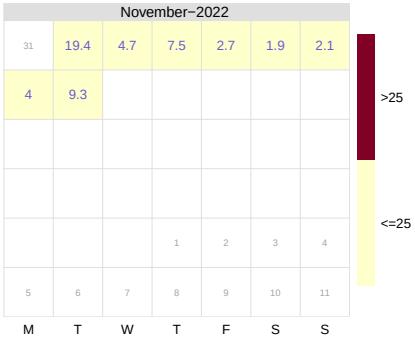

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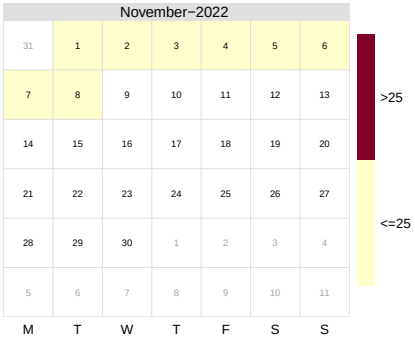
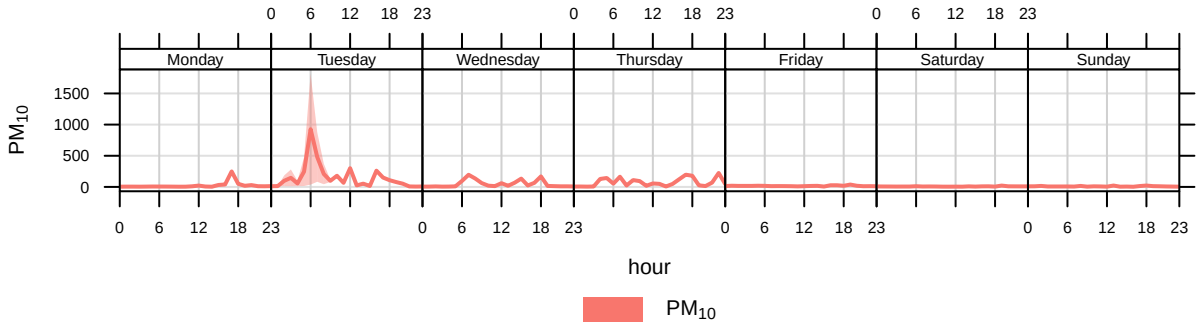
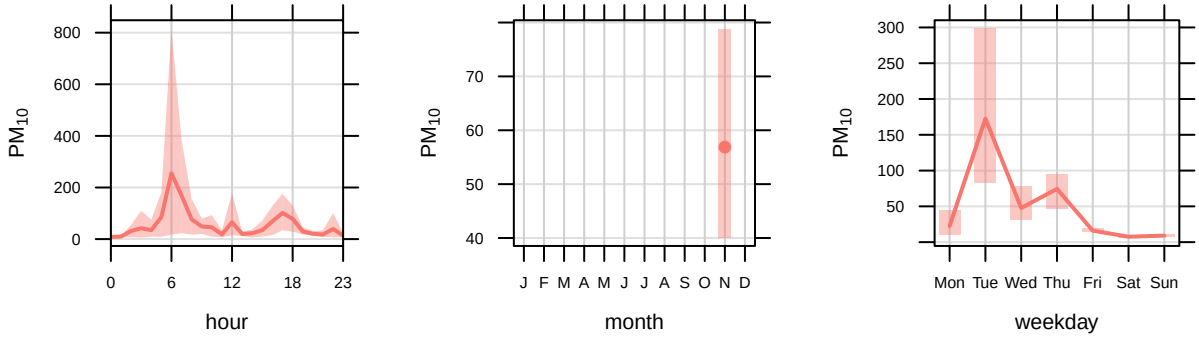


BENNETT RESOURCES

SITE: Ben399
Bi-Monthly Report
November 2022 - November 2022

PM_{10} Time variation at Ben399





mean and 95% confidence interval in mean

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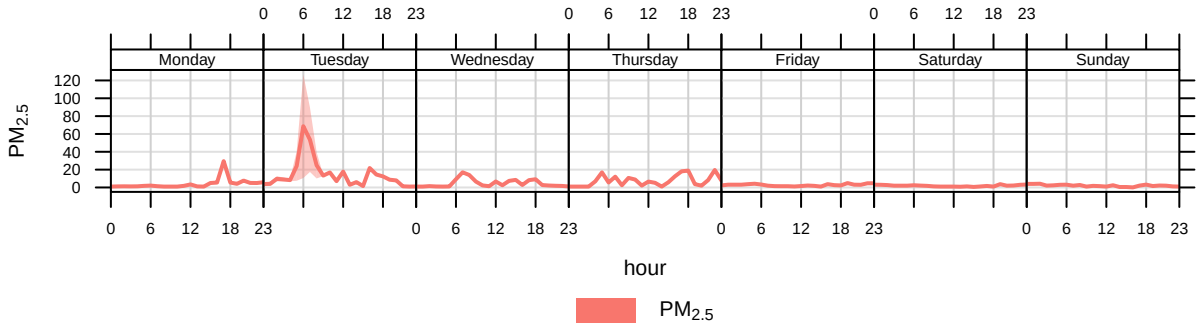
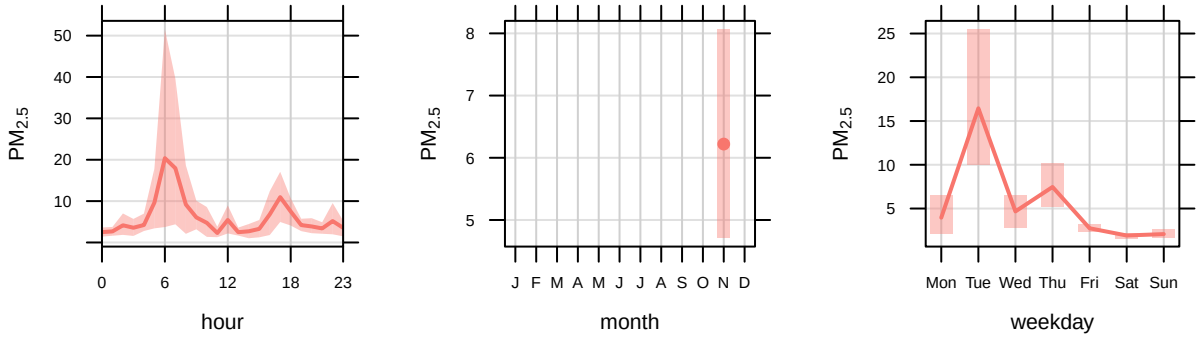
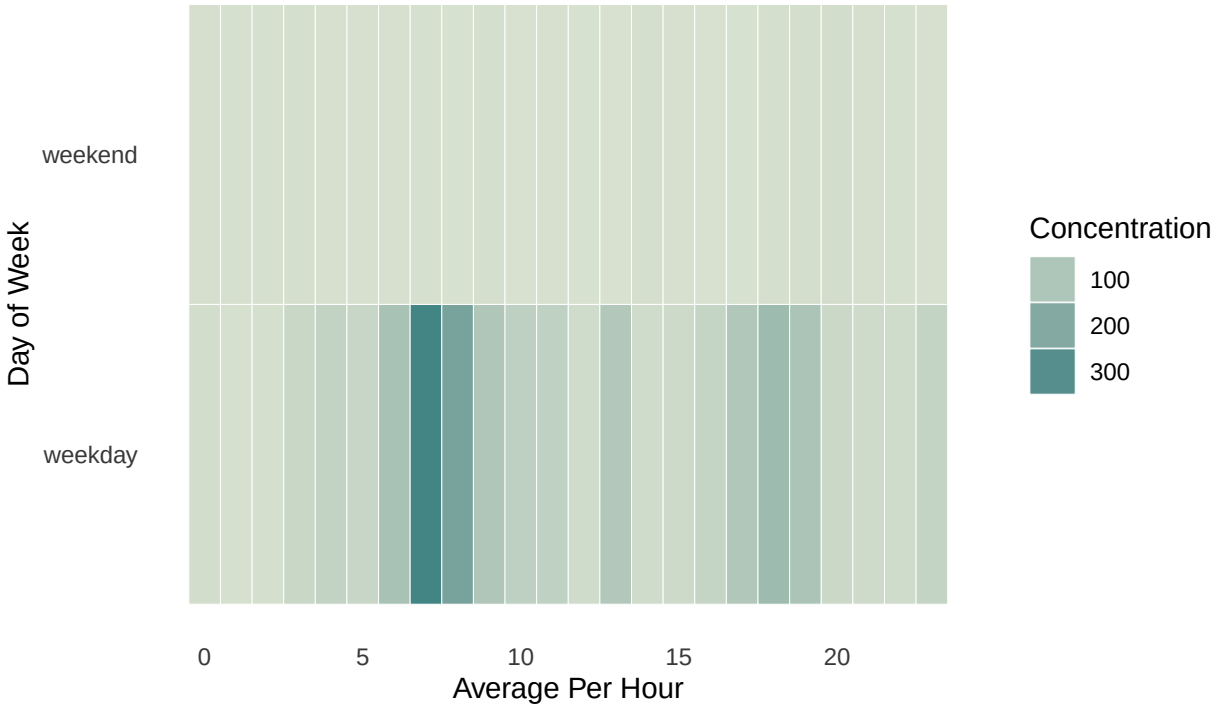


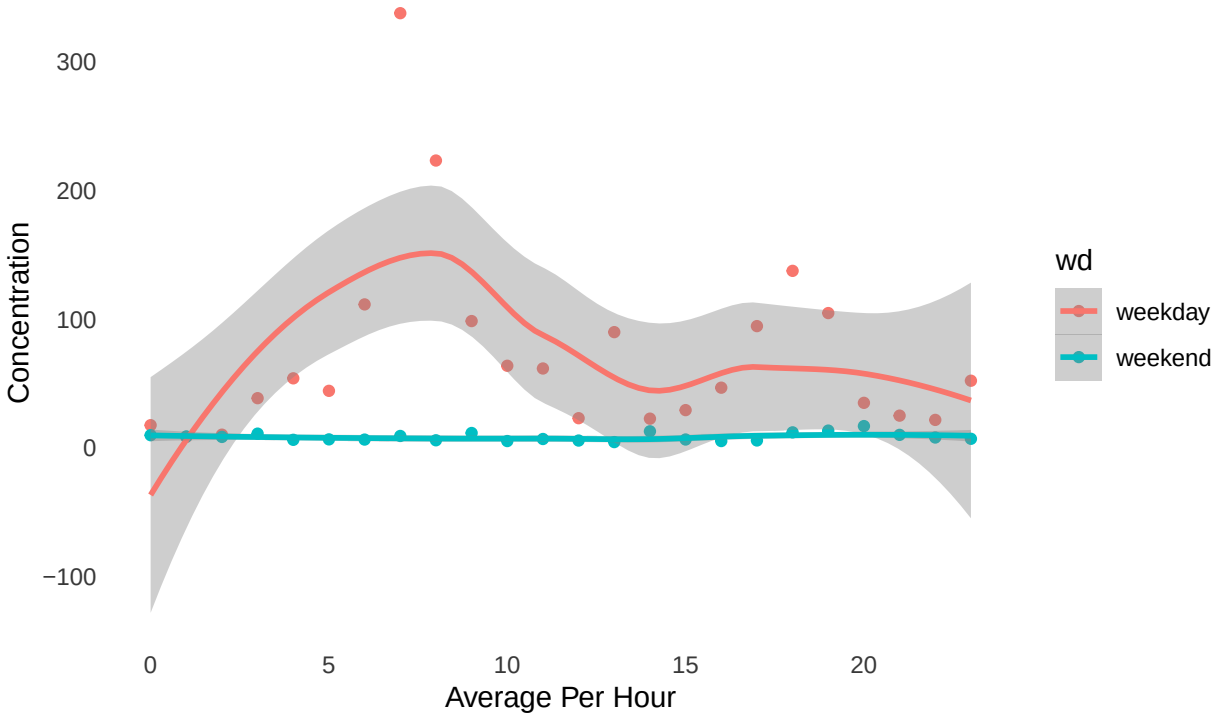


mean and 95% confidence interval in mean

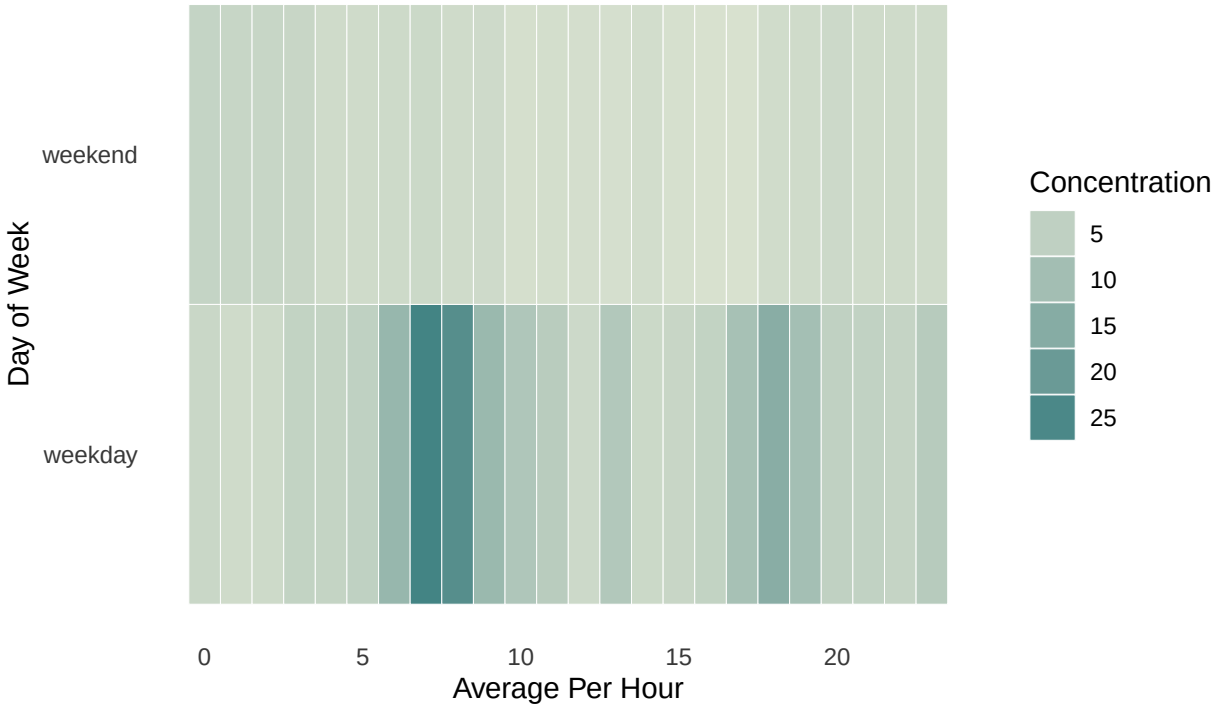
PM10 concentration by Weekday/weekend and Hour



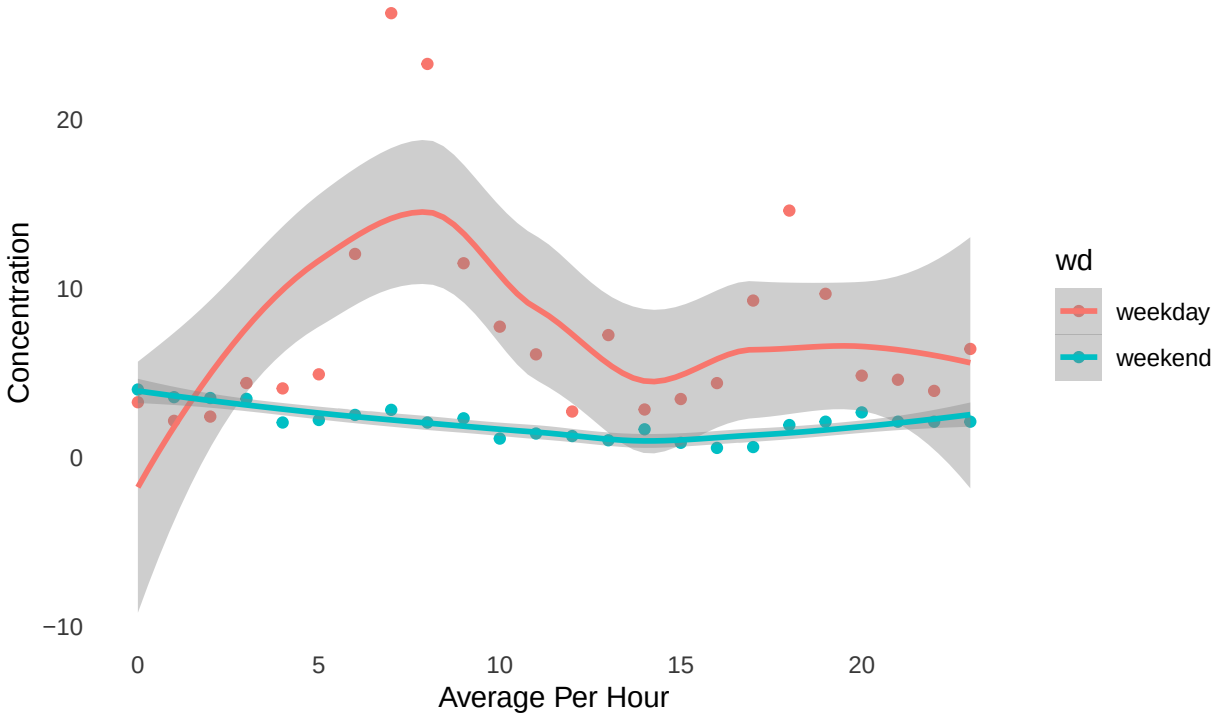
PM10 concentration by weekday and weekend with trend



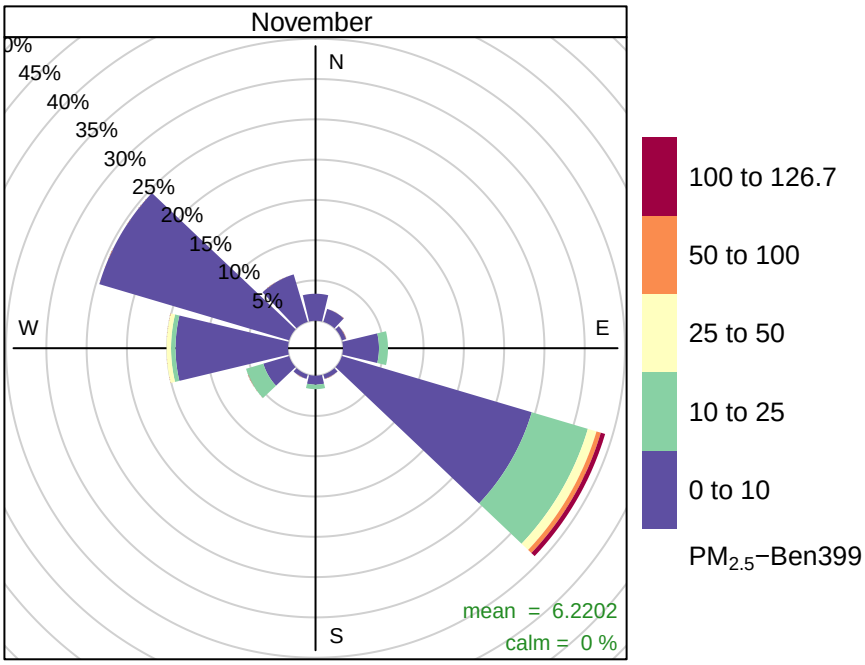
PM2.5 concentration by Weekday/weekend and Hour



PM2.5 concentration by weekday and weekend with trend

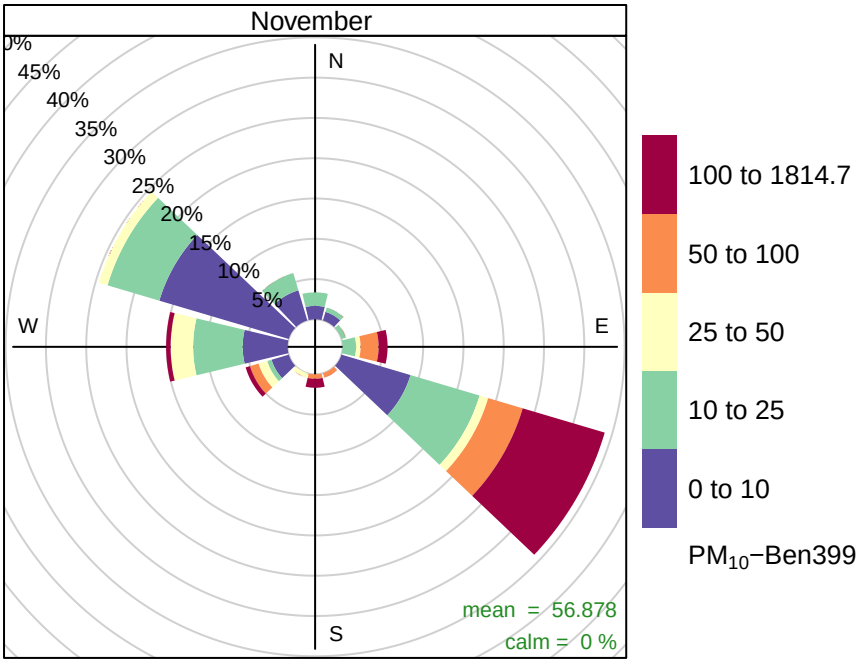


$PM_{2.5}$ pollution rose at Ben399



Frequency of counts by wind direction (%)

PM_{10} pollution rose at Ben399



Frequency of counts by wind direction (%)

Appendix I. Rockwater 2016 Hydrogeological Assessment

HYDROGEOLOGICAL ASSESSMENT OF PARADISE–VALHALLA–ASGARD PROJECT AREAS

REPORT FOR BURU ENERGY

SEPTEMBER 2016

Rockwater
HYDROGEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

Report No. {416.0/16/04b}

76 Jersey Street Jolimont 6014 Western Australia Postal: PO Box 201 Wembley 6913 Western Australia
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Appendix

I Definitions of Technical Terms Used

REVISION	AUTHOR	REVIEW	ISSUED
Rev 0	PHW, NE	JRP	21/9/16
Rev1	PHW	NE	28/9/16

1. INTRODUCTION

Buru Energy (Buru) is planning the drilling of an additional exploration well at Valhalla Central, located between the Valhalla and Asgard wells in the Canning Basin. Water will be needed for drilling and well construction, hydraulic fracturing, and the operation of camp sites. Approximately 10,000 kL, and possibly up to 34,000 kL of water are required.

Buru's existing prospects are in the Fitzroy Trough of the northern Canning Basin. They include Yulleroo, about 80 km east of Broome; Ungani, about 100 km east of Broome and 90 km south-west of Derby; Blina, 105 km east-south-east of Derby; Sundown 26 km north-west of Blina; and Paradise, Valhalla and Asgard, 150 km south-east of Derby (Fig. 1).

Rockwater was engaged to prepare this assessment of the hydrogeology of the Paradise–Valhalla–Asgard area, which includes Valhalla Central; and the results of monitoring during fracturing of reservoirs at Valhalla North and Asgard. It is an update of a report that has been prepared since 2013, and will be progressively updated as new projects are planned and additional data are collected.

Technical terms used in this report are described in Appendix I.

1.1 CLIMATE

The area has a tropical climate with hot wet summers and warm dry winters. Average rainfalls at Roebuck Plains (BoM Stn. 003023, 1902 to 2010), located 47 km west-south-west of Yulleroo 1; and at Ellendale (BoM Stn. 003008, 1919 to 2013) located 16 km north of Valhalla 1; are given in Table 1.

Table 1: Average Rainfalls (mm) at Roebuck Plains and Ellendale

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Roebuck Plains	186.2	162.9	105.3	29.9	17.0	17.5	4.2	1.7	1.8	2.7	14.4	88.1	637.7
Ellendale	170.6	155.7	106.1	16.7	12.0	5.5	4.8	0.7	2.0	9.3	26.7	91.6	614.8

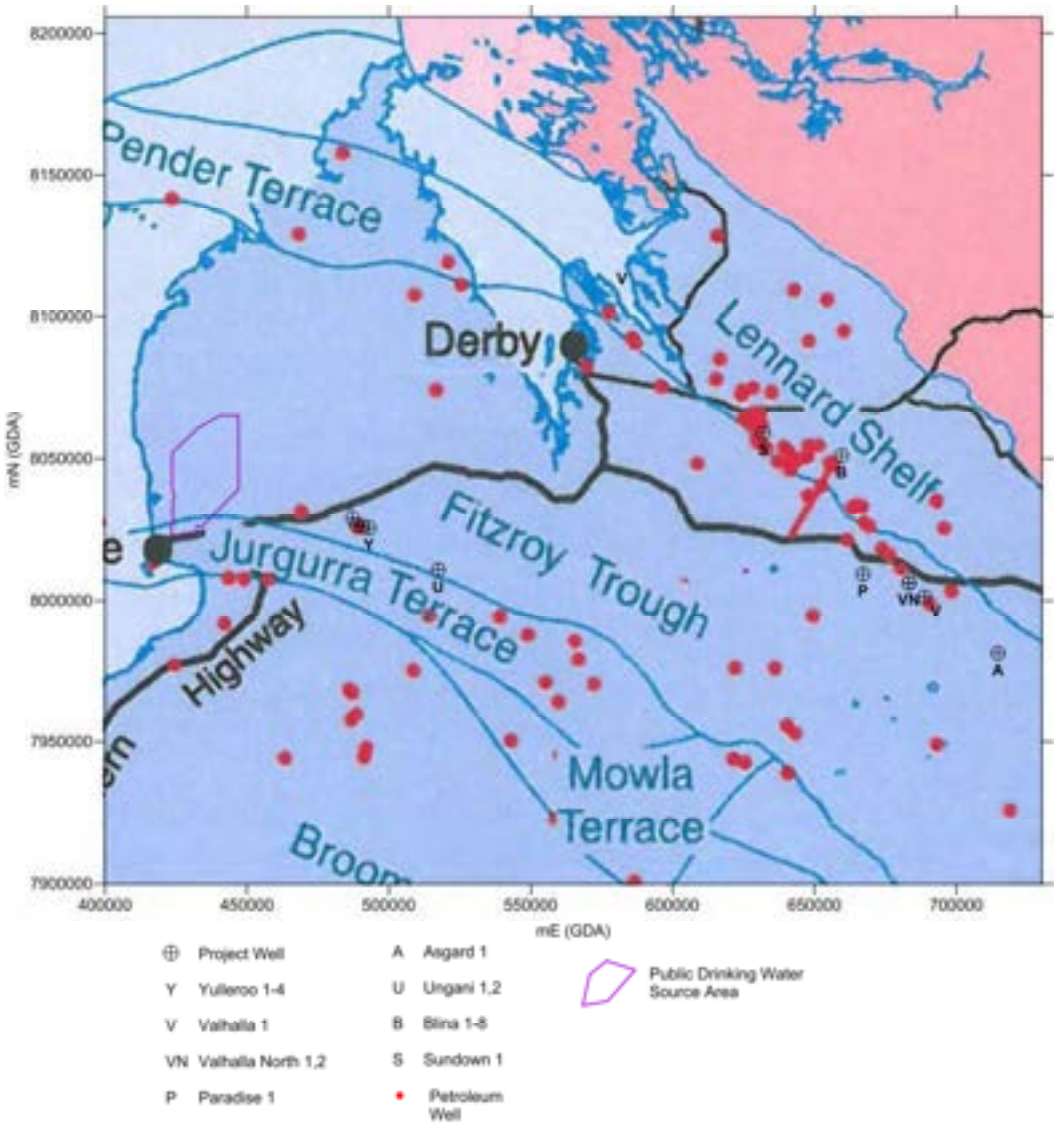
The monthly averages at both sites are remarkably similar, and indicate that about 85 % of the rain falls from December to March. Annual rainfalls do, however vary considerably, and at Ellendale have ranged from 212 mm to 1,409 mm.

Average dam evaporation at Camballin (Luke, Burke and O'Brien, 1988), located about 63 km west of Valhalla 1, is given in Table 2. It exceeds average rainfall in all months and average annual rainfall by a factor of four.

Table 2: Average Dam Evaporation (mm) at Camballin

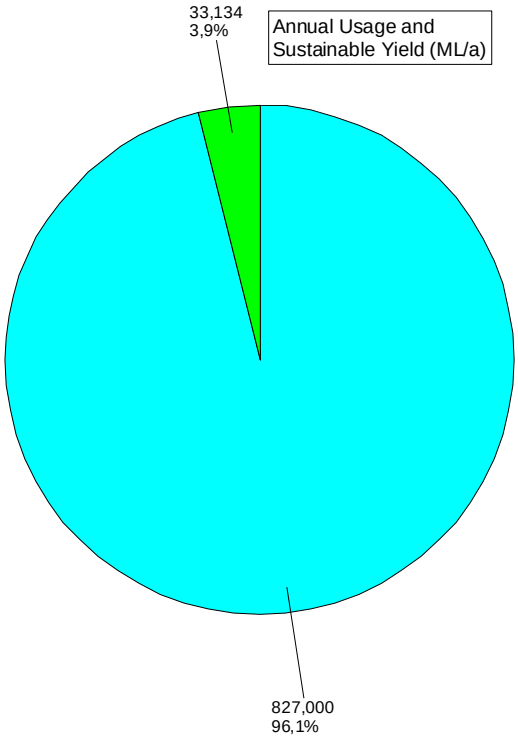
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
229	184	189	203	184	168	187	214	262	281	291	287	2,679

Figure 1: Wellfield Locations



2. HYDROGEOLOGICAL SETTING, CANNING BASIN

The Canning Basin is the second largest groundwater resource (by volume) in Australia (after the Great Artesian Basin) but there have been few studies carried out of the regional hydrogeology. Estimates of sustainable yield from the basin are about 615,000 ML/yr (WRC, 2001) and 827,000 ML/yr (ANRA, 2010). Of that, only 33,134 ML/a (less than four percent) were being consumed:



The sustainable yield is similar to that of the Lower Limestone Coast in South Australia (756,250 ML/yr) (NWC, 2005). As a comparison, the baseline groundwater allocation for the Integrated Water Supply Scheme that supplies water to Perth and some regional areas is 145,000 ML/yr; and the Water Corporation had planned to supplement the water supply with 45,000 ML/yr from the South-West Yarragadee in the southern Perth Basin where annual recharge was estimated to be about 350,000 ML/yr.

The geology of the basin has been well defined and described in publications such as Veevers and Wells (1961), Towner and Gibson (1983), and Middleton (1990).

Most of the demand for groundwater from the basin has been near Broome and Derby; and recently the western part of the basin has been investigated as a major source of water for Port Hedland.

Laws (1991a) prepared a hydrogeological map and explanatory notes for the Broome 1:250,000 sheet, and Smith (1992) completed the hydrogeological map and explanatory notes for the adjoining Derby 1:250,000 sheet. Laws (1991b) also presented a report on the groundwater resources of the wider basin at an international groundwater conference in Perth.

Ghassemi, Ferguson and Etminan (1991) used oil well data to describe the hydrogeology of deep (Permian and older) aquifers of the basin.

Harrington et al. (2011) investigated groundwater/surface water interactions in the Fitzroy River south and south-east of the Paradise – Valhalla area.

Searle (2012) produced a groundwater resource review for the Dampier Peninsula – the first regional review of the groundwater resources in part of the basin. Groundwater use on the Peninsula is concentrated on the Broome aquifer, with only minor development of the Superficial, Wallal and Liveringa aquifers. The Grant aquifer is undeveloped.

The DoW (2012) produced a West Canning Basin groundwater allocation limit report giving information on the hydrogeology of the area to be developed for the Port Hedland water supply.

The Buru wellfields lie within the Fitzroy Trough (Fig. 1), a major subdivision of the Canning Basin. The trough (Reeves, 1951) is a north-west trending graben bounded on its north-eastern side by the Beagle Bay Fault and on its south-western side by the Fenton Fault system. It is generally about 110 km wide and contains 10,000 m or more of Ordovician to Cretaceous sediments (mostly Devonian to Permian), with common folding and faulting of the Triassic and older rocks sub-parallel to the alignment of the trough.

The wellfields are remote from the Broome Public Drinking Water Source Area (PDWSA) shown in Fig. 1. There is another very small PDWSA at Camballin, 37 km west of Paradise 1, and several small circular PDWSA's south-east of Derby around individual production bores.

3. PARADISE-VALHALLA-ASGARD AREA

3.1 GEOLOGICAL SETTING

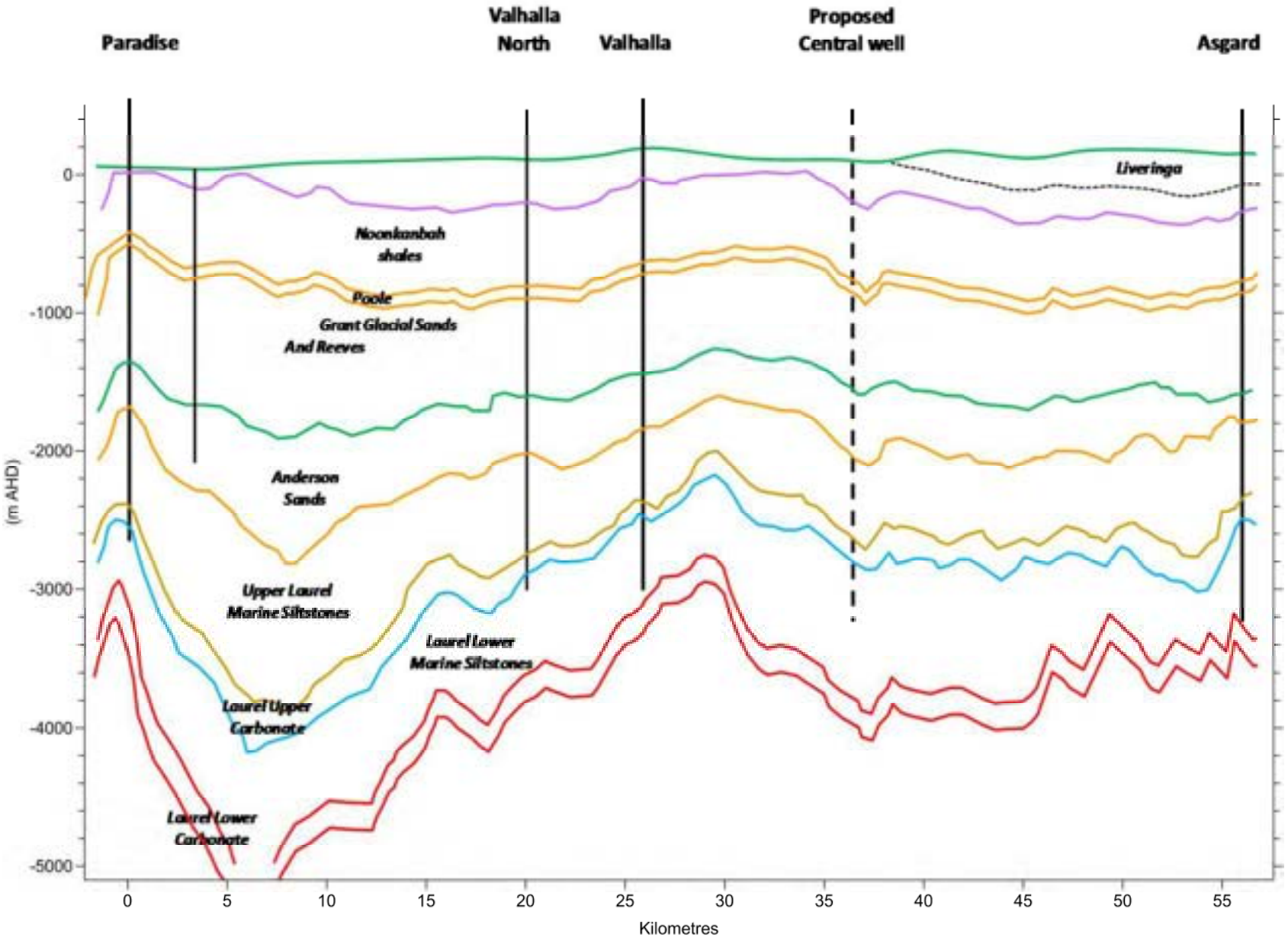
The hydrocarbon targets in this area are in the Laurel Formation, which is overlain by the Anderson and Reeves Formations of Carboniferous age; and the Grant Formation, Poole Sandstone, and Noonkanbah and Liveringa Formations of Carboniferous to Permian age. The formation boundaries of the Permian to Carboniferous sediments are at relatively consistent elevations, indicating only minor folding and faulting. The stratigraphy is summarised in Table 3.

Table 3: Stratigraphy and Aquifers in Paradise-Valhalla-Asgard Area

Formation	Dominant Lithology	Classification		Base Elevation (m AHD)			TDS (mg/L)
			Paradise 1	Valhalla 1	Valhalla Central	Asgard 1	
		Ground Level:	63.9	110		130	
Liveringa	Siltstone/shale/sandstone	Minor aquifer, Aquitard	NA	-84		-171	500 to 12,400
Noonkanbah	Shale	Aquiclude	-321	-441		-579	550 to 800
Poole Sandstone	Sandstone and Shale	Aquifer or Aquitard	-412	-524		-695	300
Grant	Sandstone	Aquifer	-1211	-1332		-1240	800-1000*
Reeves	Sandstone	Aquifer	-1309	-1588		-1606	
Anderson	sandstone, siltstone, shale	Minor aquifer, Aquitard	-1898	-1858		-1790	70,000 to 100,000?
Laurel	Limestone, shale, siltstone & sandstone	Minor aquifer, Aquitard	-3330?	<-3350		<-3,400	70,000 to 100,000?
* Estimate from Resistivity Logs							

A geological section through the area is shown in Figure 2.

Figure 2: Geological Section, Paradise-Valhalla-Asgard Area



3.2 HYDROGEOLOGY

The main aquifers are the Poole Sandstone and Grant Formation (Table 3). The Reeves Formation is also an aquifer that is generally considered as part of the Grant aquifer.

The Poole Sandstone is generally an aquifer, although the geophysical logs for Paradise 1, Valhalla North 1, and Asgard 1 indicate there is interbedded shale and sandstone in the formation in those wells, whereas sandstone dominates the Poole Sandstone in Valhalla 1. The Poole Sandstone is mainly fine grained with some medium to coarse sandstone towards the base.

The Grant Formation is much thicker than the Poole Sandstone and so a more substantial aquifer. It consists of three units (youngest to oldest): fine, and medium to coarse sandstone of the Carolyn unit; siltstone of the Winifred unit; and fine to coarse sandstone of the Betty unit (Ghassemi et al., 1991). The yield of the one WIR bore screened in the Grant Formation (Palm Spring No.1) was reported to be 655 kL/d. There are higher yields from the Formation of up to 2,400 kL/d at Ellendale. The Grant Formation forms a substantial aquifer – bore yields commonly depend on the quantity of water required and the thickness of sandstone screened. The aquifer is described in more detail in Section 4, below.

The Anderson and Laurel Formations are considered to be aquitards. The sandstone and limestone of these formations generally have low permeability but can be minor aquifers.

The Liveringa Formation forms a minor aquifer, as fine-grained sediments (siltstone and shale) dominate, and sandstone beds are less common. Bore yields given in the WIR database are generally low, and those recorded for the Liveringa and Noonkanbah Formations are all less than 100 kL/d. Drillers logs for the water bores at Valhalla, Valhalla North and Asgard 1 sites indicate the bores are screened in shale and/or siltstone with minor sandstone of the Liveringa Formation, and generally yield about 100 kL/d (maximum 200 kL/d in one bore at Asgard 1).

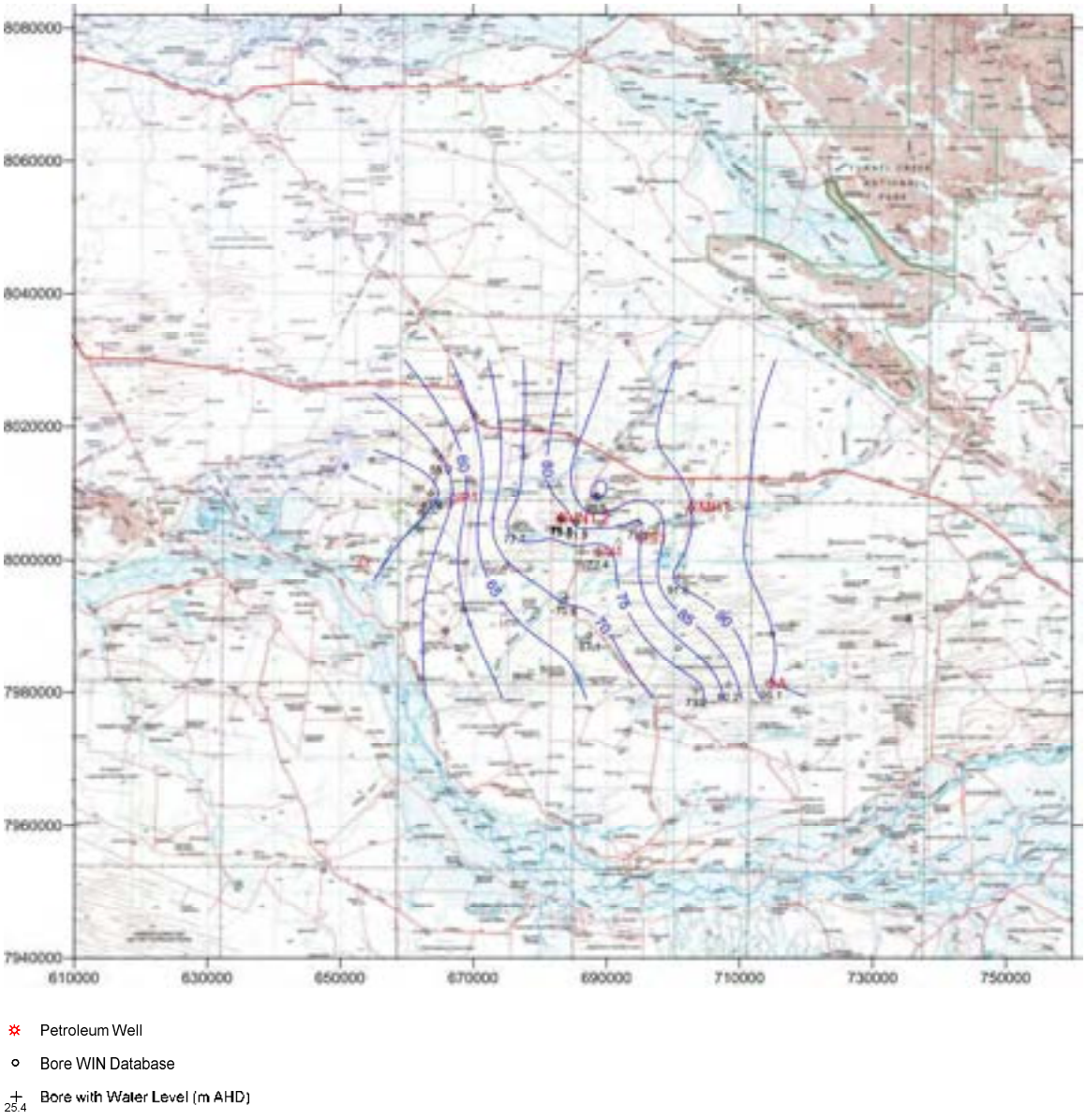
There are also some bores screened in the Noonkanbah Formation, which consists mainly of fine-grained sediments but does have some limestone and fine to medium grained sandstone interbeds. Those bores (in the Noonkanbah Formation) are mostly near and to the north of the Valhalla and Valhalla North wells. Two bores near Paradise 1 are reported to be in the Poole Sandstone, as are several others east of Mount Hardman. Some bores in the Asgard area, south-east of Valhalla are screened in the Blina Shale and others in the underlying Liveringa Formation.

3.2.1 Groundwater Levels

Groundwater levels measured in bores by Buru environmental staff, and in bores recorded in the WIR database (reduced to m AHD using approximate elevations given by Elevation Finder) have been used to construct the water level contour plan shown in Figure 3. They indicate that there is a westerly groundwater flow with some groundwater discharge to the Fitzroy River.

Recorded water table depths are 30 m (Valhalla North) and 36 m (Valhalla 1), and are likely to be similar at Valhalla Central.

Figure 3: Groundwater Levels (m AHD) Valhalla Area, Oct. 2012



3.2.2 Aquifer Parameters

Core data analysed and presented by Buru Energy indicate that permeabilities and porosities of all potential hydrocarbon reservoirs are highly variable, but in general:

- Most Grant Formation permeabilities range from 100 to 5000 milli-Darcys (mD) (0.08 to 4 m/d) and porosities 15 to 25 percent. Some higher permeabilities (8 to 20 m/d) have been measured by test-pumping at Ellendale where the formation crops out.
- Anderson Formation permeabilities range from 10 to 500 mD (0.008 to 0.4 m/d) and porosities 10 to 20 percent; and
- Laurel Formation permeabilities are mostly less than 1 mD (0.0008 m/d) and porosities less than 10 percent.

Ghassemi et al. (1991) also analysed data from cores and gave a permeability of 0.075 m/d and porosity 14 percent for the Poole Sandstone; and permeability of 0.10 m/d and porosity 11 percent for the Grant Formation.

There are no data for the minor aquifers/aquitards/aquicludes – the Blina Shale, and the Liveringa and Noonkanbah Formations.

3.2.3 Recharge, Flow Directions and Discharge

Groundwater in the shallow formations is recharged by the infiltration of rainfall. Recharge rates are probably low due to the predominance of fine-grained sediments near ground surface.

Groundwater in the surficial Blina Shale, and Liveringa and Noonkanbah Formations will be recharged from local infiltration of rainfall where they outcrop, or by downward movement from one formation to the other where they are layered. The infiltration will be retarded by clay, shale and siltstone layers, both above and below the water table. The water table depth ranges from 7 m at Paradise 1 water bore to 30 m at Valhalla 1 and Valhalla North water bores. Water is likely to take between 70 and 300 days to travel from the ground surface to the water table.

Outcrop and potential recharge areas for the Poole Sandstone and Grant Formation are generally small, such as in the Saint George Ranges to the south. Much of the recharge is probably by downward leakage from overlying formations and rainfall runoff from the Devonian Limestone of the Oscar Range to the east.

The water level contours (Fig. 3) indicate that groundwater in the Liveringa and Noonkanbah Formations generally flows westwards, and this is also expected to be the

case for the deeper aquifers. There are also indications from the shape of contours which tend to be parallel to the Fitzroy River, that there is a southerly component to the flow with some flow towards, and discharge to the Fitzroy River from the shallow formations.

Harrington et al. (2011) found there was a strong connection between groundwater and the Fitzroy River south and south-east of the Valhalla area, with a calculated groundwater discharge of 102 ML/d over a 100 km reach of the river.

Assuming a hydraulic conductivity of 1 m/d for permeable beds within the Liveringa and Noonkanbah Formations, a specific yield of 0.1 and hydraulic gradients of about 0.00185 at Paradise 1 and 0.00058 at Valhalla 1; groundwater would take about 465 years to reach the closest receptor, Robbins Bore 3.14 km to the west, and about 3,600 years to move from Paradise 1 to the river. Similarly, the groundwater would take about 105 years to move from Valhalla 1 to Halfway Bore, 224 m to the south-west, and 16,000 years to move from Valhalla 1 to the river. The current status of those two station bores is not known.

Detail of groundwater-level contours near Valhalla Central and the direction of groundwater flow are shown in Fig. 4.

Figure 4: Groundwater Level Contours (m AHD) Near Valhalla Central

With a hydraulic gradient of about 0.0017 at Valhalla Central; groundwater would take at least 4,500 years to reach any waterhole in Hardman Creek, and about 7,300 years to move from Valhalla Central to the Fitzroy River.

Flow in the deeper formations probably continues to the west beneath the river. The flow velocities will be very low due to the low permeabilities – at least 150 times lower than in the shallow formations.

3.2.4 Water Quality

Salinities, where recorded in the WIR database and by Buru Energy, are generally less than 1,000 mg/L TDS in the Liveringa Formation, but range from 500 to 12,400 mg/L TDS. Salinities for Buru water bores in the Liveringa Formation range from 450 to 1,600 mg/L TDS. Those for bores screened in the Noonkanbah Formation generally range from 550 to 800 mg/L TDS, but are up to 2,300 mg/L TDS. The three salinities available for the Poole Sandstone range from 200 to 325 mg/L TDS. The one bore recorded that is screened in the Grant Formation had a salinity of 860 mg/L TDS.

Crowe and Towner (1981) reported salinity measurements made in 138 station bores and wells during mapping of the Noonkanbah geological sheet, and related them to the formations screened. Those for bores/wells on stations in the Paradise-Valhalla-Asgard area had the following salinity ranges recorded:

- Blina Shale; 10,000 to >15,000 mg/L TDS;
- Liveringa (Hardman) Formation; 220 to 3,900 mg/L TDS (average 1,600);
- Noonkanbah Formation; 340 to 7,000 mg/L TDS (average 2,500);
- Poole Sandstone; 200 to 900 mg/L TDS (average 420); and
- Grant Formation; 200 mg/L TDS (one bore).

Water samples have been taken from 10 bores in the Valhalla-Paradise-Asgard area on a number of occasions as part of baseline water quality sampling by Buru, and analysed by ChemCentre or SGS for a wide range of parameters. The results are included on the Buru website: http://www.buruenergy.com/2015-tight-gas-pilot-exploration-program/

The water samples were generally brackish to saline, with salinities ranging from 560 mg/L TDS (Homestead 1) to 22,000 mg/L TDS (Crossland Bore). With the elevated salinities, most samples exceeded Australian drinking water guidelines for salinity, sodium, chloride, sulphate and hardness. Also, boron, iron and manganese guideline values were exceeded in many of the samples.

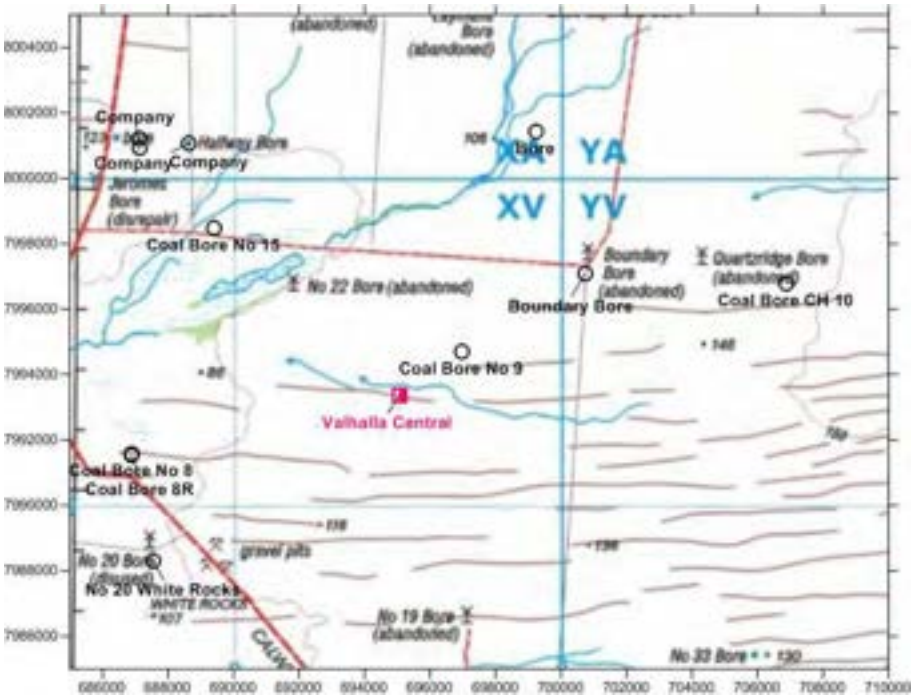
The elevated sulphate concentrations (96 to 752 mg/L) were similar to the chloride levels, which is unusual.

Field measurements of physico-chemical parameters are also being made on 10 bores in the area to provide background data. These results are also given in the Buru website.

3.3 IMPACT OF SITE ACTIVITIES, VALHALLA CENTRAL

Bores recorded in the WIR database within about 10 km of the Valhalla Central site are shown in Fig. 5. There are few details for these bores, but most appear to be coal exploration holes/bores that extended through the Liveringa Formation into the underlying Noonkanbah Formation and have probably been abandoned. Most or all of the station bores have also been abandoned, including Boundary Bore, the closest to the Valhalla Central site.

Figure 5: WIR Bores near Valhalla Central



It is very unlikely that there are any operating bores or wells that could be impacted by operations at the Valhalla Central site.

3.3.1 Groundwater Level Changes

A small quantity of groundwater is likely to be needed for camp construction and exploration well drilling in this area. This water might be available from the Liveringa

Formation, which can include minor aquifers, although the formation is quite thin at Valhalla Central.

Low hydraulic conductivity could result in relatively high water-level drawdown in the pumped bore, but measurable drawdowns would not be transmitted more than a few hundred metres from the bore, and groundwater levels would recover quickly once the pumping ceased.

This has been shown by close monitoring at the Valhalla North and Asgard sites, where extraction from bores with screened intervals at least 100 m deep in the Liveringa Formation had little or no impact on groundwater levels in nearby monitoring bores screened at shallow depths in the formation. For example at Valhalla North (Rockwater, 2016) pumping of the production bore caused small, short-term drawdowns of up to 0.07 m to 0.08 m in monitoring bores located only 27 m to 55 m away. For most of the period of extraction, no drawdowns were detected.

3.3.2 Water Quality Changes

Chloride concentrations were also closely monitored in bores at the Valhalla North and Paradise sites before, during and after hydraulic fracturing (HF) operations were conducted. That ion was selected as a key indicator, as concentrations in the HF fluid and in the flow-back water were several orders of magnitude higher than in the shallow groundwater. There were no indications from the monitoring (Figs. 6 and 7) of any impact from operations at the sites on groundwater quality. The dashed line in the figures (which were produced by Buru) represents the start of the HF operations.

Figure 6: Chloride Concentrations at Asgard 1 Well Site

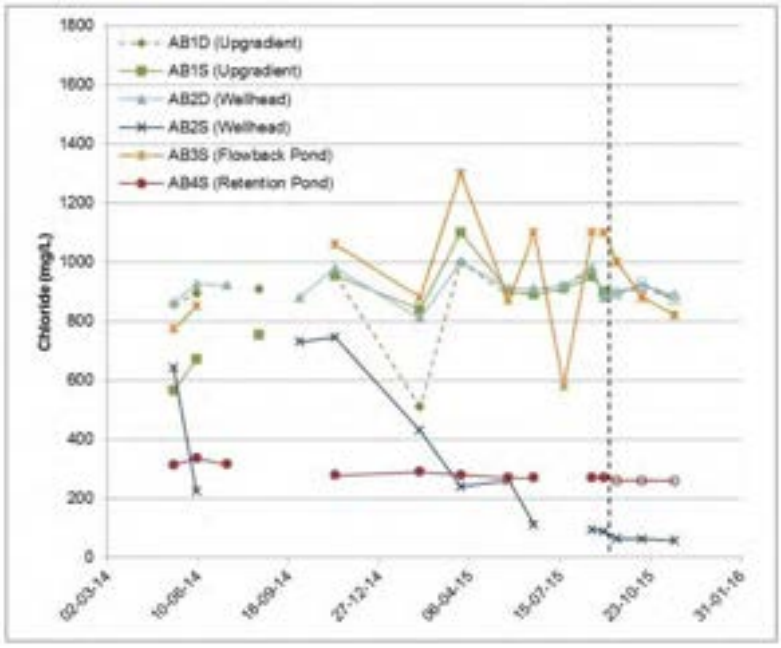
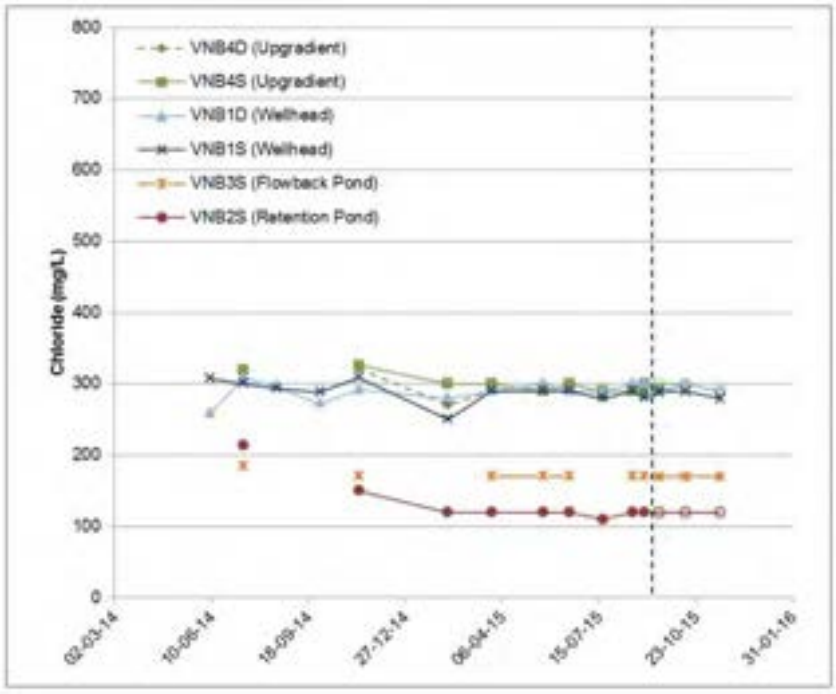


Figure 7: Chloride Concentrations at Valhalla North 1 Well Site



Similarly, it is considered very unlikely that the planned operations at Valhalla Central will have any impact on groundwater quality.

3.3.3 Numerical Modelling to Predict Impacts, Valhalla Central

A simple numerical groundwater model was constructed to predict potential groundwater-level drawdowns around a production bore at the planned Valhalla Central site. It consists of a rectangular grid of 57 rows, 57 columns and two layers covering an area of 5 km by 5 km centred on a production bore. Layer 1 extends to 50 m depth, and Layer 2 to 170 m depth. Model cell sizes range from 25 m by 25 m near the production bore, to 100 m by 100 m in peripheral areas. It utilises Processing Modflow Pro version 8.0.45, which incorporates MODFLOW, groundwater modelling software designed by the US Geological Survey (McDonald and Harbaugh, 1988).

The model was set up initially with parameters that are typical of a minor aquifer such as the Liveringa Formation, and then parameters were adjusted to calibrate the model to drawdowns observed in the two (relatively) deep monitoring bores at Valhalla North from 3 July to 8 July 2015, after which groundwater levels recovered rapidly to pre-pumping levels.

Water meter readings indicate that a total of 1,955 kL were pumped to 26 July – if all that was pumped over the five day period that would be an average of 390 kL/d, and that rate was simulated in the model. Drawdowns increased to 0.08 m in bore VNB1D located 55 m

west of the production bore, and to 0.07 m in VNB4D, 27 m east of the bore. The production bore was modelled in Layer 2, and the monitoring bores in Layer 1.

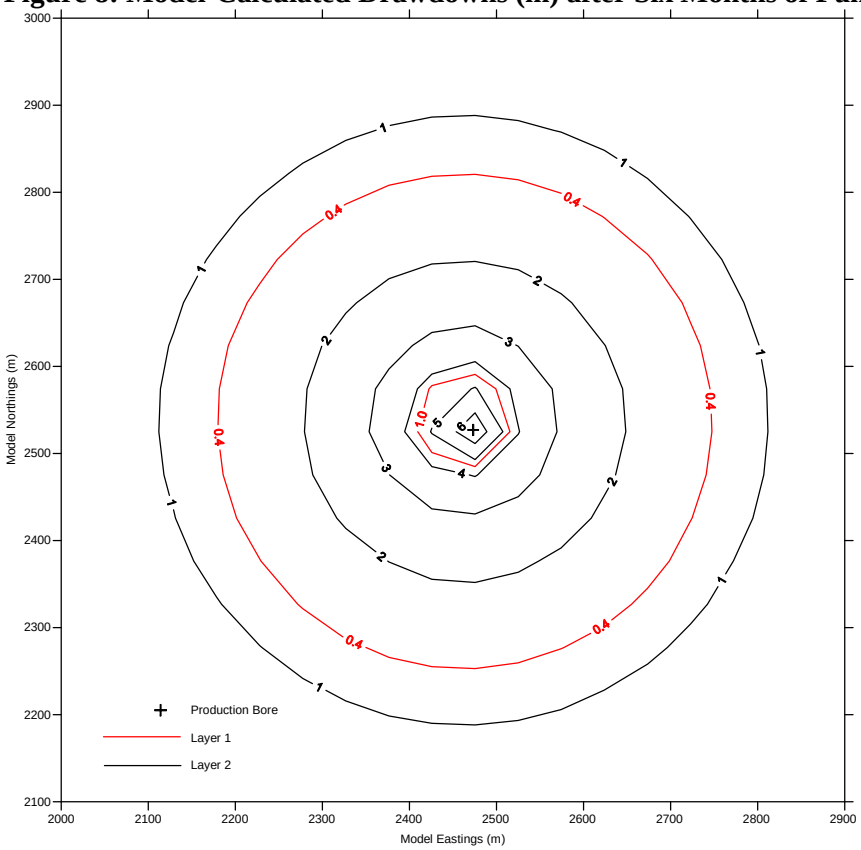
A close correspondence (within 0.01 m) was achieved between measured and model-calculated drawdowns with the parameters given in Table 4.

Table 4: Parameters Adopted in Model Calibration

Parameter:	Unit	Layer 1	Layer 2
Horiz. Hydraulic Conductivity	m/d	0.05	0.12
Vert. Hydraulic Conductivity	m/d	0.005	0.01
Specific Yield	v/v	0.05	NA
Storage Coefficient	v/v	NA	0.0003

The model was then run to predict groundwater-level drawdowns arising from pumping a bore over a six-month period (as at Valhalla North) at the average rate required to produce the total allocation for Valhalla North (33,400 kL), i.e. 183 kL/d. The calculated drawdowns after six months of extraction are shown for each model layer in Fig. 8.

Figure 8: Model-Calculated Drawdowns (m) after Six Months of Pumping 183 kL/d



They indicate that drawdowns of 1 m or more could extend up to 410 m from a production bore at the (deep) level of the screens in the production bore, but that there would be smaller drawdowns in the top 50 m of the Formation: 1.2 m close to the bore decreasing to 1 m at a distance of about 56 m from the bore, and 0.1 m at 690 m distance. Although the

modelling is based on assumed parameters and the results are not unique, the calculated drawdowns are consistent with monitoring at Valhalla North and Asgard, where drawdowns at shallow depths (albeit with lower pumping rates) have been very small, and difficult to distinguish from normal seasonal fluctuations of about 0.2 to 1 m (depending on the frequency and magnitude of recharge events).

Sensitivity Analysis

As a sensitivity analysis, the modelling was repeated for pumping over six months to produce a volume of 10,000 kL (the quantity used in the last exploration programme); and for 100,000 kL, the likely volume that would be needed for a commercial field. The results are summarised with those for the licensed allocation (given above), in Table 5.

Table 5: Results of Sensitivity Analysis

Model Scenario	Max. Drawdown at Bore (m)		Distance from Bore of 1 m Drawdown (m)	
(Water Vol., kL)	Layer 1	Layer 2	Layer 1	Layer 2
10,000	0.35	2.8	N/A	106
33,400	1.2	9.5	56	410
100,000	3.5	28	340	780

Even with pumping for the maximum volume, groundwater levels would be expected to recover to within 0.2 m of the static water level within hours of the cessation of pumping, and to fully recover within weeks.

3.3.4 Potential for Impacting Stygofauna and Troglofauna

Likelihood of Occurrence, Valhalla Central

A brief desktop study was undertaken to assess the potential risk to stygofauna and troglofauna at the Valhalla Central project. As part of the desktop study, various literature and data were reviewed, including previous subterranean fauna studies in the region, WA Museum data, available hydrogeological reports, and project-specific data supplied by Buru.

The Liveringa Formation forms the upper-most aquifer in the Project area and consists of mainly fine-grained sediments (siltstone and shale) with more-permeable sandstone beds being less common. The shallow shale and siltstone sediments of the formation provide a potential habitat for stygofauna, although bore yields in the area suggest that permeability is low, and so it is less likely that stygofauna will be present.

Groundwater salinity is within a range that stygofauna are known to occur, with salinities of local bores ranging from 450 to 1,600 mg/L TDS.

Groundwater extraction is seen to be the principal activity that could potentially affect stygofauna at Valhalla Central. Any drawdown of groundwater level in surficial aquifers could reduce the habitat available for stygofauna. Indirect impacts such as groundwater contamination, changes to hydrology, and nutrient balances also have the potential to affect subterranean habitats.

The absence of caves or significant voids in the fine-grained sediments at Valhalla Central indicates that there is unlikely to be suitable habitat for troglofauna. Given the nature of disturbance of the Valhalla Central exploration proposal, there is unlikely to be a direct impact to any troglofauna habitat (if present).

Recorded Occurrence Elsewhere

Stygofauna

There are few published studies of stygofauna in the Kimberley and only one record of stygofauna sampling within 50 km of Valhalla. The results of published studies in the region are summarised below.

Nine species of stygofauna have been identified within rocks at the Ellendale Diamond Mine (Ellendale), 45 km north-east of Valhalla (Rockwater, 2015). At Ellendale, the diamond-bearing ore consists of olivine lamproite with tuffaceous margins. Groundwater occurs in shallow aquifers comprising weathered, calcified or calcretised lamproite; and in deep aquifers of tuffaceous sandstone and fractured lamproite, particularly along geological contacts. The stygofauna community at Ellendale included five species of copepod, three species of ostracod and an isopod. After consultation with DER, a stygofauna monitoring plan was adopted for the project and annual samples were taken from a number of reference sites to assess the long-term impacts of mining and dewatering. Ongoing sampling confirmed that the project was unlikely to have a negative impact on the local community, and the species collected were unlikely to be restricted.

A comprehensive stygofauna sampling programme was undertaken to assess the stygofauna values of the Browse LNG Development on the Dampier Peninsula, 60 km north of Broome (Rockwater 2012). The survey targeted shallow sandstone within the unconfined Broome aquifer. The Broome aquifer typically consists of unconsolidated coarse-grained sandstone and conglomerate with minor lenses of siltstone and claystone, and thin coal seams (Laws 1991a). The survey recorded 18 stygofauna species in total, although only nine occurred within the impact area of the Browse LNG Precinct. This represented a relatively rich stygofauna community and the first such community reported on the Dampier Peninsula. Regional sampling demonstrated that five of the nine species collected in the Precinct also occur at several regional locations, up to 75 km from the

Precinct. Regional stygofauna communities were identified at Barred Creek, Coconut Well, Broome townsite, Nita Downs Station, Beagle Bay and Kilto Station.

Two potential stygofauna species were collected at Nicolson's Find, a gold deposit approximately 280 km south-east of Valhalla. A widespread tubificid worm (*Pristina longiseta*) and a potential new species of *Strandesia* (Ostracoda) were collected from mineral exploration holes, drilled into metasediment (Rockwater, 2012b). Other taxa within the genus *Strandesia* are often found in surface water and it was considered unlikely that the Nicolson's Find species would be confined to the project area. It was determined that the stygofauna species recorded within the project area were stygophiles, having opportunistically colonized the local aquifers via passive dispersal.

The alluvial aquifers of the Ord River Irrigation Area (ORIA) are known to contain unique stygofauna communities in the north-east Kimberley. Humphreys (1999) and Ecowise (2005) identified stygofauna in areas of the Stage 2 (M2) ORIA development, approximately 500 km north-east of Valhalla. The studies identified syncarids, copepods, ostracods, oligochaetes and oribatid mites from alluvial sediments within the ORIA.

Stygofauna sampling for the Argyle Diamond Mine in the north-east Kimberley identified at least 15 species of stygofauna (EPA 2005). Cho, Park and Humphreys (2005) described six species of Parabathynellidae from the Kimberley region, including taxa recorded at Argyle and from the ORIA.

Sampling at Sorby Hills (550 km north-east of Valhalla) yielded ten species from six orders or higher level groups (Bennelongia, 2012). These included nematodes, an oligochate worm (order Tubificida) and four orders of crustacean – (Ostracoda, Copepoda, Syncarida and Isopoda). Sampling targeted river flood plains, as well as low sandstone hills and eroded limestone reefs.

Troglofauna

There are very few published records or results of troglofauna sampling in the Kimberley region. The Western Australian Museum lists records of troglofauna in the Kimberley, primarily from cave complexes. Three species of spider (*Myrmopopaea 'lipposa', Wandella pallida* and *Opopaea phineus*) were collected from caves in the Ningbing Ranges north of Kununurra, with nearby caves recording pseudoscorpions (*Indohya gollum, Lagynochthonius* sp.), diplurans (*Cocytocampa humphreysi*) and cockroaches (*Nocticola brooksi*). Caves within the Oscar Ranges also recorded troglobitic pseudoscorpions (*Cheiridium* sp.nov) and schizomids (*Bamazomus hunti*). Napier Range caves recorded similar faunal groups, with pseudoscorpions (*Indohya napierensis*) and schizomids (*Apozomus eberhardi*). Two of the described schizomids (*Apozomus eberhardi* and *Bamazomus hunti*) have been categorised as troglobitic, although the specimens

possess eye spots and it is likely that they are troglophiles, inhabiting sheltered environments within the gorges (Harvey, 2001).

Museum records also list troglobitic pseudoscorpions at the Argyle Diamond Mine in the north-east Kimberley. *Indohya* '*sp.Argyle Mine*' was collected from one site during a 2005 sampling programme.

An extensive sampling programme was undertaken for the Brown Range Project, near the WA–NT boarder (Outback Ecology, 2014). Sampling targeted the widesread and contiguous regolith, and weathered fractured rock. Over 160 samples were collected over five sampling rounds, yielding only two troglobitic species. Both species were also collected outside the project area and it was concluded that because of the continuity and extent of the subsurface habitiat, any species present were unlikely to be restricted.

A desktop assessment at Nicolson's Find, located approximately 280 km south-east of Valhalla, focused on strongly weathered oxidised metasediment (Rockwater, 2012b). The assessment concluded that the geological units within the project area and in the immediate area surrounding the deposits did not provide suitable subterranean habitat for troglofauna.

None of the listed studies represent sampling in comparable habitats to those at Valhalla Central.

Concluding Comments

Based on results of previous sampling, it appears that sandstone aquifers of the Kimberley contain moderately diverse stygofauna communities with very few stygofauna species restricted at small (project level) scales. The range of groundwater salinities recorded at Valhalla are within the tolerance levels recorded for stygofauna, and the shale and siltstone of the Liveringa Formation could potentially provide habitats for stygofauna. However, the reported low yields from bores screened in this formation suggest that suitable voids within sediments may be limited. The absence of more permeable sandstone lithologies previously reported to support stygofauna communities in the Kimberley may indicate that the potential for stygofauna is moderate to low. The regional extent of aquifers in the project area and absence of any geological barriers that may prevent dispersal suggest that any stygofauna community at Valhalla is unlikely have a restricted distribution.

Given the relatively small impact areas (drawdowns of at least one metre over a 400 m radius) surrounding production bores, it is unlikely that the project will have a significant impact on the stygofauna values of the area or that the disturbance of potential habitat at Valhalla would result in a level of impact that would result in unacceptable risks to the conservation status of any stygofauna community.

Based on results of the risk assessment, it is likely that low intensity sampling in accordance with relevant EPA guidelines would be appropriate for scenarios where approximately 100,000 kL of groundwater may be extracted from a bore over a six-month period. This would correspond to a commercial well pad which would likely be subject to an EPA assessment under the *Environmental Protection Act 1986*, in which case stygofauna may be considered as a relevant environmental factor.

Troglofauna records of the Kimberley are all associated either with cave complexes or subterranean habitats within ranges and gorges that are vastly different to those at Valhalla Central. The fine-grained sediments within the project area do not appear to provide suitable habitat for troglofauna.

4. GRANT AQUIFER

4.1 BACKGROUND

The Betty unit of the Grant aquifer is likely to be the deepest aquifer that could potentially be impacted by Buru's activities. That unit and the shallower Carolyn unit form the Grant aquifer. Buru is to conduct a risk assessment on the Grant aquifer, and so Rockwater was requested to review the available hydrogeological data for the aquifer to provide baseline information to be used in the risk assessment.

4.2 OCCURRENCE

The Grant Formation extends over most of the Canning Basin, including the Fitzroy Trough, and in the northern Canning Basin comprises three units – the Carolyn, Winifred and Betty (Ghassemi et al., 1991).

The depth and thickness of the Grant Formation generally increases from west to east through the Buru wellfields, although the base elevation and thickness are less at the eastern Asgard 1 bore (Table 6).

Table 6: Top and Base Elevations, Grant Formation, Buru Wells

Well	Ground Level	Elevation of Grant Fm		Thickness
	(m AHD)	Top (mAHD)	Base (mAHD)	(m)
Yulleroo 4				
Yulleroo 2	57	-376	-677	301
Ungani 1	78	-766	-1259	493
Paradise 1	64	-412	-1211	799
Valhalla North	109	-715	-1499	784
Valhalla 1	110	-524	-1332	808
Asgard 1	123	-695	-1246	551

Also, the Formation outcrops between Ungani 1 and Paradise 1 on the eastern side of the Fitzroy River in the Grant Range; and south-west of Ellendale it thickens from north-east to south-west.

The main area of outcrop is near the northern edge of the Canning Basin, along a south-easterly line extending from about 65 km east-north-east of Derby to south-east of Fitzroy Crossing. This area is about 40 km north-east of Valhalla and 30 km north-east of Asgard. The width of outcrop is up to 23 km.

The Grant Formation also outcrops 45 km south of Asgard in the Saint George Ranges. Both the Saint George and Grant Ranges are eroded anticlines within the Fitzroy Trough.

The top of the formation is shallowest at Yulleroo 2 (433 m below ground level) and deepest at Valhalla North (824 m below ground level). The base of the formation is also deepest at Valhalla North (1,609 m below ground level); and the formation is thickest at Valhalla 1 (808 m).

The Grant Formation, where saturated, is known as the Grant aquifer, which is one of the major aquifers of the Canning Basin, producing substantial quantities of water at Fitzroy Crossing and at the Ellendale diamond mine.

4.3 GEOLOGY

The Grant Formation is of Carboniferous to early Permian in age and unconformably overlies the Reeves Formation at Ungani; and the Anderson Formation in the Yulleroo and Valhalla –Paradise-Asgard areas. It is unconformably overlain by the Poole Sandstone at Ungani and in the Valhalla-Paradise-Asgard area, and by the Wallal Sandstone at Yulleroo, and so is in direct hydraulic connection with those aquifers.

The Formation is marine to lagoonal in origin and comprises massive fine to coarse grained sandstone, with minor siltstone and shale.

The Grant Formation in the northern Canning Basin consists of three units (youngest to oldest): fine to coarse grained sandstone with some conglomerate and shale of the Carolyn unit; siltstone of the Winifred unit; and fine to coarse sandstone of the Betty unit (Ghassemi et al., 1991, Smith, 1992). The youngest and oldest units are aquifers, and the middle unit is an aquiclude or aquitard.

4.4 HYDROGEOLOGY

4.4.1 Groundwater in Storage

Laws (1991b) estimated that the volume of groundwater stored in the Grant Formation in the Canning Basin is about 35,000 x 10^9 m^3 (35 million gigalitres (GL)). This compares with a volume of 1.1 million GL of water stored in the Yarragadee aquifer south of Bunbury in Western Australia (Water Corporation, 2005).

4.4.2 Aquifer Parameters

Ghassemi et al. (1991) analysed data from drill core and side-wall cores from petroleum wells and gave a permeability of 0.10 m/d and porosity of 11 percent for the Grant Formation. Core data analysed by Buru Energy indicate that Grant Formation permeabilities average 0.43 m/d and porosity averages 18 percent.

Hydrogeological information on the Grant Formation is available from bores at the Ellendale mine-site, 50 km north of Valhalla, where the Formation outcrops. There the aquifer has a saturated thickness of 110 to 250 m or more, and hydraulic conductivities range from 1.2 to 20 m/d and average about 8 m/d.

At Fitzroy Crossing sandstone of the aquifer is strongly cemented and generally of low permeability – successful bores intersect fractures and joints (DoW, 2008). Elsewhere such as at Ellendale, the permeability is mostly associated with primary porosity.

4.4.3 Recharge, Flow Directions and Discharge

The Grant aquifer is recharged directly by rainfall, and from flow in the Fitzroy River and other creeks, in outcrop areas such as along the northern edge of the basin and in the Saint George Ranges to the south. These areas are relatively small and so recharge volumes are probably low. The relationship with the overlying Poole and Wallal Sandstones is not known (Laws, 1991b) – there is likely to be recharge from them to the Grant aquifer in some areas, and discharge from the aquifer to them in other areas. Runoff from the Devonian limestone of the Oscar Range probably enhances the recharge in some areas such as at Ellendale.

Groundwater in the Grant aquifer generally flows westward from the main outcrop areas towards the coast in Roebuck Bay and King Sound, to discharge to the ocean off-shore.

Based on groundwater depths given in DoW (2008) and levels shown on the Derby Hydrogeological Sheet (Smith, 1992), heads in the aquifer fall from about 100 m AHD at Fitzroy Crossing to 50 m AHD on the Grant Range and would be about 5 m AHD near the coast.

4.4.4 Aquifer Development

The aquifer is poorly utilised at present but it has been developed in areas of outcrop or subcrop including the Fitzroy Crossing town borefield, bores on Gogo Station, and the borefield at the Ellendale diamond mine.

Potential bore yields for the aquifer in the Buru wellfield areas are not known, however bore yields of 600 to 2,400 m^3/d have been achieved at Ellendale, and up to 500 m^3/d from bores in the Fitzroy Crossing town water supply borefield (Lindsay and Commander, 2006). Palm Spring No. 1, located 30 km north-north-east of Valhalla 1 and not far from the outcrop area, intersected the Grant Formation at 142 m depth, and had a reported yield of 655 m^3/d (WIR database).

Yields are likely to be lower where the aquifer is deep, as there could be fewer open fractures and joints, and lower primary porosity.

4.4.5 Groundwater Quality

Groundwater salinity generally increases with distance from the recharge areas, and probably with depth in the aquifer.

The groundwater at Ellendale has salinity of about 300 mg/L TDS, and salinities are usually in the range 500 to 2,000 mg/L TDS elsewhere, i.e. fresh to brackish (Lindsay and Commander, 2006). The low salinity at Ellendale is attributed to runoff from the Devonian ranges nearby and consequent high rates of recharge. The water from the Fitzroy Crossing borefield is also fresh, with salinity of about 250 mg/L TDS based on the electrical conductivity values reported in DoW (2008).

In the Valhalla-Paradise area groundwater in the aquifer is likely to be fresh to brackish with salinity in the range 800 to 2,300 mg/L TDS, and one possible salinity of about 14,000 mg/L TDS, all estimated from the resistivity logs.

At Ungani, groundwater in the Grant Formation is estimated to have a salinity of 6,600 mg/L TDS, also from the resistivity logs. North of the Ungani area, Smith (1992) reports salinities for the basal Betty unit of 2,700 to 6,400 mg/L TDS, increasing up to 70,000 mg/L TDS on the Dampier Peninsula. The uppermost Carolyn unit and Poole Sandstone

have salinities of 250 to 2,600 mg/L TDS north of Ungani near the outcrop area and up to 25,000 mg/L TDS on the Dampier Peninsula (Smith, 1992).

Groundwater salinity in the Yulleroo area is indicated from the resistivity and conductivity logs to be about 14,000 mg/L TDS.
The concentrations of other water-quality parameters for the aquifer are not known, except in the recharge areas at Ellendale and Fitzroy Crossing where the groundwater is fresh. For example, water from the Fitzroy Crossing bores is circum-neutral with pH 6.8 to 7.1; barium, boron, dieldrin, fluoride, nitrate, nitrite and uranium were all well within ADWG values (NH&MRC, 2011); and aluminium, iron and manganese were also low although in one sample iron just exceeded the aesthetic guideline value with a concentration of 0.34 mg/L (DoW, 2008).

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Principal

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APPENDIX I

DEFINITIONS OF TECHNICAL TERMS USED

Term	Meaning
AHD	Australian Height Datum
Anticline	A structural fold that is convex upward
Aquiclude	Rock units of very low permeability that form barriers to fluid flow.
Aquifer	A geological formation able to receive, store and transmit significant quantities of water
Aquitard	A saturated unit of low hydraulic conductivity that can store and slowly transmit groundwater either upward or downward depending on the vertical hydraulic gradient
Brackish Water	Water containing between 1,000 and 3,000 mg/L of total dissolved solids, tasting slightly salty
Confining Layer	A bed of significantly lower hydraulic conductivity which retards the vertical movement of water
Discharge	The release or extraction of water from an aquifer. Typical mechanisms of natural discharge are evapotranspiration by phreatophytes, springs, and drainage to surface water bodies
DST	Drill Stem Test is a procedure for isolating and testing the pressure, permeability and productive capacity of a geological formation during the drilling of a petroleum well.
Electrical Conductivity (EC)	The measure of a solution's (or rock's) ability to conduct electricity. EC units are used to express salinity levels in water.
Fresh Water	Water containing less than 500 to 1,000 mg/L of total dissolved solids, and generally suitable for drinking
GPS	Global Positioning System: a satellite navigation system that provides location and time
Groundwater	Water occurring below the land surface in pores or fissures, generally in motion and part of the hydrological cycle
Graben	An elongated block that has been down-thrown along bounding faults
Hydraulic Conductivity	The capacity of a porous medium to transmit water through a unit cross-sectional area. Hydraulic conductivity is dependent upon the physical properties of the porous medium and the viscosity of the water
Hypersaline	Water of salinity greater than that of sea water (35,000 mg/L Total Dissolved Solids)
Outcrop	The exposure of rock or sediment at ground surface
Permeability	The ability of a porous medium to transmit water under a given hydraulic gradient. Similar to hydraulic conductivity
Pindan	A red soil composed of silty and clayey fine to medium sand typical of the south-western Kimberley
Porosity	A measure of the void or pore space within rocks and sediments (the ratio of the volume of void spaces to the total volume)
Resistivity	The measure of a solution or rock to resist the transmission of electricity. The inverse of electrical conductivity
Saline Water	Water containing more than about 3,000 mg/L of dissolved salts
Slug Test	An aquifer permeability test in which a slug, typically a volume of water, is instantaneously placed in a bore, displacing the water upward. Measurements of the falling water levels are used to estimate permeability
Sustainable Yield	Commonly the quantity of water that can be pumped from an aquifer without depleting the volume in storage and without causing deleterious environmental impacts. Definition is subject to debate.
Total Dissolved Solids (TDS), or Salinity	The total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water, typically expressed in units of milligrams per litre of water (mg/L)
Water Table	The surface of the groundwater in an unconfined aquifer
Wetland	An area saturated with water either permanently or seasonally. Typically supports a distinct ecosystem. Can be an expression of the water table
Yield	The rate at which water can be pumped from a bore

Appendix J. Local Groundwater Characterisation Results

Groundwater Monitoring Bores

Cell is yellow where the limit of reporting (LoR) is halved

		Depth to Water	Physicals and inorganics													Anions and Cations (DISSOLVED)					Metals (TOTAL / DISSOLVED FROM MAY 2021)															Hydrocarbons	
	Units	mBTOC	pH Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L
Bore Name	Date Sampled	Depth (mBTOC)	pH in water	EC	TDS	Chloride	Fluoride	Silica	SO_4	NO_3	Hardness as $CaCO_3$	Carbonate, CO_3^{2-} as $CaCO_3$	Bicarbonate, HCO_3 as $CaCO_3$	Hydroxide, OH^- as $CaCO_3$	Total Alkalinity as CaCO3	Ca	K	Mg	Na	Na absorption ratio	Ag	Al	As	Ba	B	Cd	Cu	Cr	Cr VI	Fe	Hg	Mn	Ni	Pb	Se	Sr	Zn	Benzene	Ethylbenzene
AB1S	9/01/2015	24.52		4400	2800	900	0.9	21	700	0.025	540	0.5	540	2.5	450	71	55	88	800		0.0025	0.71	0.0025	0.064	1.1	0.00025	0.0025	0.007		2.1	0.00005	0.25	0.0025	0.0025	0.0025	2.5	0.0125	0.25	0.25
AB1D	9/01/2015	23.5		4400	2800	890	0.9	21	700	0.025	540	0.5	540	2.5	440	69	56	89	830		0.0025	0.033	0.0025	0.035	1.1	0.00025	0.0025	0.0025		0.16	0.00005	0.022	0.0025	0.0025	0.0025	2.9	0.0125	0.25	0.25
VNB4S	9/01/2015	30.62		2300	1500	300	1	35	350	0.025	530	0.5	650	2.5	530	100	23	65	330		0.0025	0.12	0.009	0.22	0.44	0.00005	0.0005	0.002		2.5	0.00005	2.8	0.002	0.0005	0.0005	1.4	0.006	0.25	0.25
VNB4D	9/01/2015	31.03		1900	1100	290	0.4	26	230	0.025	330	0.5	430	2.5	350	55	16	48	280		0.0025	0.24	0.002	0.33	0.46	0.00005	0.0005	0.003		0.45	0.00005	1.4	0.002	0.0005	0.0005	1.7	0.008	0.25	0.25
VNB4S	26/03/2015	30.59				300			340			0.5	630	2.5	520																							
VNB4D	26/03/2015	31.03				290			220			0.5	450	2.5	370																							
AB1S	27/03/2015	24.5				1100			770			0.5	520	2.5	430																							
AB1D	27/03/2015	23.46				1000			760			0.5	520	2.5	430																							
AB1S	19/05/2015					900			700			0.5	530	2.5	440																							
AB1D	19/05/2015					890			700			0.5	530	2.5	430																							
VNB4S	19/05/2015					290			350			0.5	640	2.5	520																							
VNB4D	19/05/2015					290			220			2	440	2.5	360																							
VNB4S	15/06/2015	30.6				300			360			0.5	650	2.5	530																							
VNB4D	15/06/2015	31.08				290			230			0.5	440	2.5	360																							
AB1S	16/06/2015	24.48				890			700			0.5	540	2.5	440																							
AB1D	16/06/2015	23.56				900			700			0.5	530	2.5	440																							
AB1S	19/07/2015					910			690			0.5	530	2.5	430																							
AB1D	19/07/2015					920			690			0.5	530	2.5	440																							
VNB4S	19/07/2015					290			350			0.5	670	2.5	550																							
VNB4D	19/07/2015					280			230			0.5	410	2.5	340																							
VNB4S	14/09/2015	30.63		2400	1400	300	0.9	33	340	0.025	520	0.5	650	2.5	530	100	23	65	330		0.0005	0.053	0.009	0.21	0.44	0.00005	0.002	0.001		2.7	0.00005	2.8	0.002	0.0005	0.0005	1.4	0.005	0.25	0.25
VNB4D	14/09/2015	31.03		1900	1100	290	0.4	25	240	0.025	330	0.5	420	2.5	340	55	16	47	280		0.0005	0.027	0.001	0.29	0.44	0.00005	0.0005	0.001		0.3	0.00005	1.3	0.005	0.0005	0.0005	1.7	0.0025	0.25	0.25
AB1S	15/09/2015	24.51		4600	2800	890	0.9	20	690	0.025	530	0.5	540	2.5	450	71	53	86	790		0.0005	0.3	0.001	0.045	1.1	0.00005	0.0005	0.003		1.1	0.00005	0.2	0.002	0.0005	0.0005	2.5	0.0025	0.25	0.25
AB1D	15/09/2015	23.5		4600	2700	900	0.8	20	700	0.025	520	0.5	540	2.5	440	68	54	86	810		0.0005	0.031	0.005	0.03	1.1	0.00005	0.0005	0.0005		0.12	0.00005	0.014	0.005	0.0005	0.0005	2.8	0.009	0.25	0.25
AB1S	2/10/2015	23.34				840			670			0.5	500	2.5	410																							
AB1D	2/10/2015	23.44				510			330			0.5	520	2.5	420																							
AB1S	13/10/2015	24.5		4700	2800	930	0.8		710	0.07	520	0.5	540	2.5	440	67	55	85	840		0.0005	0.042	0.001	0.037	1.1	0.00005	0.0005	0.001		0.77	0.00005	0.15	0.0005	0.0005	0.0005	2.2	0.0025	0.25	0.25
AB1D	13/10/2015	23.48		5000	2900	910	0.8		710	0.12	520	0.5	540	2.5	440	65	57	86	860		0.0005	0.026	0.0005	0.027	1	0.00005	0.0005	0.0005		0.13	0.00005	0.013	0.0005	0.0005	0.0005	2.2	0.007	0.25	0.25
VNB4S	14/10/2015	30.62		2200	1500	300	1		340	0.025	500	0.5	640	2.5	530	96	24	63	330		0.0005	0.15	0.008	0.18	0.45	0.00005	0.002	0.002		2.5	0.00005	2.4	0.002	0.0005	0.0005	1.3	0.007	0.25	0.25
VNB4D	14/10/2015	31.1		1800	1100	300	0.4		240	0.025	310	0.5	420	2.5	340	49	16	44	270		0.0005	0.014	0.001	0.27	0.45	0.00005	0.0005	0.0005		0.3	0.00005	1.1	0.0005	0.0005	0.0005	1.5	0.003	0.25	0.25
VNB4S	2/11/2015	30.6				300			320			0.5	640	2.5	520																							
VNB4D	2/11/2015	30.97				270			190			0.5	440	2.5	360																							
VNB4S	17/11/2015	30.51		2300	1500	290	0.9		340	0.025	520	0.5	640	2.5	520	100	23	65	330		0.0005	0.04	0.007	0.16	0.41	0.00005	0.0005	0.0005		2.3	0.00005	2.3	0.001	0.0005	0.0005	1.2	0.008	0.25	0.25
VNB4D	17/11/2015	31.08		1900	1100	290	0.3		250	0.025	330	0.5	410	2.5	340	56	16	47	290		0.0005	0.012	0.001	0.22	0.4	0.00005	0.0005	0.001		0.13	0.00005	1.1	0.001	0.0005	0.0005	1.3	0.0025	0.25	0.25
AB1S	18/11/2015	24.1		4600	2800	870	0.8		710	0.07	550	0.5	550	2.5	450	73	57	88	830		0.0025	0.75	0.0025	0.063	0.99	0.00025	0.0025	0.009		1.2	0.00005	0.19	0.0025	0.0025	0.0025	2.1	0.0125	0.25	0.25
AB1D	18/11/2015	22.79		4600	2800	880	0.8		700	0.09	560	0.5	540	2.5	440	72	55	91	860		0.0025	0.029	0.0025	0.035	1.1	0.00025	0.0025	0.014		0.17	0.00005	0.018	0.009	0.0025	0.0025	2.4	0.0125	0.25	0.25
VNB4S	15/12/2015	29.62		2300	1500	290	0.9	32	340	0.06	520	0.5	610	2.5	500	100	23	63	290		0.0005	0.11	0.007	0.21	0.36	0.00005	0.0005	0.019		2.2	0.00005	2.1	0.014	2.2	0.0005	1.2	0.018	0.25	0.25
VNB4D	15/12/2015	30.2		1900	1100	290	0.3	25	240	0.15	330	0.5	390	2.5	320	55	15	46	250		0.0005	0.037	0.001	0.25	0.38	0.00005	0.002	0.002		0.2	0.00005	1	0.001	0.2	0.0005	1.3	0.011	0.25	0.25
AB1S	16/12/2015	24.51		4500	2900	950	0.8	20	690	0.12	530	0.5	520	2.5	430	71	53	85	760		0.0025	0.15	0.0025	0.05	1	0.00025	0.0025	0.007		0.77	0.00005	0.19	0.0025	0.77	0.0025	2.6	0.0125	0.25	0.25
AB1D	16/12/2015	23.37		4500	2900	950	0.8	20	700	0.18	530	0.5	520	2.5	430	69	54	86	780		0.0025	0.11	0.0025	0.034	1	0.00025	0.0025	0.01		0.14	0.00005	0.014	0.0025	0.14	0.0025	2.8	0.11	0.25	0.25
VNB4S	27/01/2016			2300	1400	290	0.9		350	0.025	500	0.5	610	2.5	500	95	24	63	310		0.0005	0.49	0.008	0.24	0.43	0.00005	0.003	0.014		2.2	0.00005	2.2	0.004	0.001	0.0005	1.4	0.029	0.25	0.25
VNB4D	27/01/2016			1900	1100	290	0.3		260	0.025	310	0.5	390	2.5	320	50	16	44	270		0.0005	0.6	0.002	0.41	0.45	0.00005	0.003	0.015		0.89	0.00005	1.2	0.003	0.004	0.0005	1.7	0.036	0.25	0.25
VNB4S	19/04/2016			9000	5700	2100	1		1900	0.025	1100	0.5	550	2.5	450	190	27	160	28		0.0005	0.098	0.006	0.13	1.4	0.00025	0.024	0.017		1.5	0.00005	1.4	0.021	0.0005	0.0025	3.6	0.026	0.5	0.7
VNB4D	19/04/2016			2100	1200	330	0.4		290	0.025	370	0.5	380	2.5	310	61	17	52	8.2		0.0005	0.1	0.002	0.24	0.4	0.00005	0.004	0.006		0.55	0.00005	1.1	0.005	0.001	0.0005	1.7	0.013	0.25	0.25
AB1S	20/04/2016			4500	2900	930	0.8		700	0.09	540	0.5	530	2.5	430	71	53	89	16		0.0005	4.1	0.0005	0.003	0.14	0.00005	0.008	0.0005		0.11	0.00005	0.024	0.001	0.0005	0.0005	0.11	0.018	0.25	0.25
AB1D	20/04/2016			4500	2800	930	0.8		700	0.11	540	0.5	520	2.5	430	70	53	88	16		0.0005	0.032	0.0005	0.042	1.6	0.00005	0.003	0.002		0.18	0.00005	0.021	0.002	0.0005	0.0005	2.6	0.006	0.25	0.25
AB1S	27/07/2016			4700	2800	940	0.8	20	670	0.025	550	0.5	530	2.5	440	77	52	86	880		0.0025	6.2	0.02	0.14	0.67	0.00025	0.007	0.019		31	0.00005	0.27	0.01	0.006	0.0025	2.5	0.0125	0.25	0.25
AB1D	27/07/2016			4700	2800	970	0.8	20	680	0.11	530	0.5	520	2.5	430	73	52	85	880		0.0025	0.096	0.0025	0.027	0.61	0.00025	0.0025	0.0025		0.25	0.00005	0.006	0.0025	0.0025	0.0025	2.5	0.0125	0.25	0.25
VNB4S	28/07/2016			2300	1400	300	1	32	330	0.025	570	0.5	600	2.5	490	120	24	68	340		0.0005	0.28	0.006	0.15	0.4	0.00005	0.002	0.003		2.2	0.00005	1.7	0.003	0.0005	0.0005	1.4	0.006	0.25	0.25
VNB4D	28/07/2016			1900	1100	290	0.3	25	250	0.025	340	0.5	360	2.5	300	59	15	47	300		0.0005	0.14	0.003	0.24	0.45	0.00005	0.0005	0.006		2.2	0.00005	0.99	0.002	0.001	0.0005	1.6	0.0025	0.25	0.25
AB1S	10/12/2016	24.4		4700	2800	940	0.8	19	720	0.025	570	0.5	530	2.5	430	73	51	95	980		0.0025	1.1	0.0025	0.059	0.89	0.00025	0.0025	0.0025		3.6	0.00005	0.13	0.0025	0.0025	0.0025	2.3	0.0125	0.25	0.25
AB1D	10/12/2016	18.2		4800	2800	940	0.8	20	710	0.11	570	0.5	530	2.5	430	70	52	95	990		0.0025	0.098	0.0025	0.039	0.91	0.00025	0.0025	0.0025		0.36	0.00005	0.019	0.0025	0.0025	0.0025	2.6	0.0125	0.25	0.25
VNB4S	10/12/2016	30.3		2300	1400	290	0.9	32	340	0.025	550	0.5	600	2.5	490	100	20	69	340		0.0005	0.099	0.006	0.16	0.34	0.00005	0.0005	0.001		1.7	0.00005	1.5	0.002	0.0005	0.0005	1.3	0.0025	0.25	0.25
VNB4D	10/12/2016	31.1		2000	1100	300	0.3	25	260	0.025	330	0.5	370	2.5	300	54	14	48	320		0.0005	0.037	0.002	0.26	0.41	0.00005	0.0005	0.002		0.27	0.00005	0.94	0.001	0.0005	0.0005	1.6	0.0025	0.25	0.25
AB1S	23/05/2017	24		4900	2900	890	0.8	20	690	0.06	550	0.5	530	2.5	430	73	52	89	920	17.1	0.0005	0.11	0.002	0.033	0.88	0.00005	0.0005	0.004		1.3	0.00005	0.12	0.002	0.0005	0.0005	2.4	0.0025	0.25	0.25
AB1D	23/05/2017	22.85		4800	2800	880	0.8	20	690	0.15	550	0.5	520	2.5	430	72	53	90	950	17.5	0.0005	0.18	0.001	0.039	0.97	0.00005	0.0005	0.003		0.3	0.00005	0.01	0.002	0.0005	0.0005	2.6	0.006	0.25	0.25
VNB4S	24/05/2017	30		2300	1400	300	0.9	32	330	0.025	530	0.5	600	2.5	500	110	22	65	330	6.3	0.0005	0.22	0.006	0.14	0.31	0.00005	0.001	0.002		1.6	0.00005	1.5	0.002	0.001	0.0005	1.3	0.012	0.25	0.25
VNB4D	24/05/2017	30		1900	1100	310	0.3	26	260	0.025	330	0.5	360	2.5	300	55	15	46	320	7.6	0.0005	0.1	0.003	0.22	0.37	0.00005	0.0005	0.003		0.41	0.00005	0.83	0.001	0.001	0.0005	1.6	0.01	0.25	0.25
AB1S	29/11/2017	24.02		4600	2900	870	0.8	19	680	0.2	550	0.5	550	2.5	450	73	49	90	730		0.002	9.2	0.011	0.56	0.88	0.00005	0.019	0.038		25	0.00005	2	0.026	0.013	0.0005	2.3	0.046	0.25	0.25
AB1D	29/11/2017	22.88		4600	2900	890	0.8	20	690	0.21	540	0.5	540	2.5	440	70	49	90	730		0.0005	0.071	0.0005	0.032	0.87	0.00005	0.0005	0.0005		0.23	0.00005	0.023	0.0025	0.0005	0.0005	2.3	0.0025	0.25	0.25
VNB4S	30/11/2017	30.5		2300	1500	300	1	31	320	0.025	540	0.5	610	2.5	500	110	20	67	290		0.0005	0.51	0.006	0.12	0.4	0.00005	0.001	0.003		2.4	0.00005	1.2	0.006	0.0005	0.0005	1.3	0.006	0.25	0.25
VNB4D	30/11/2017	31		1900	1200	310	0.3	24	260	0.025	330	0.5	360	2.5	300	56	13	47	270		0.0005	0.043	0.003	0.19	0.45	0.00005	0.0005	0.001		0.64	0.00005	0.82	0.0025	0.0005	0.0005	1.5	0.0025	0.25	0.25
AB1S	24/05/2018			4800	2900	910	0.8	20	690	0.07	530	0.5	520	2.5	430	71	47	86	720		0.0005	7.8	0.014	0.16	1.2	0.00005	0.008	0.036		22	0.00005	0.41	0.024	0.009	0.0005	2.6	0.03	0.25	0.25
AB1D	24/05/2018	22.7		4800	2800	900	0.8	20	690	0.11	530	0.5	510	2.5	420	69	46	87	740		0.0005	1.5	0.006	0.035	1	0.00005	0.002	0.007		5.8	0.00005	0.07	0.004	0.002	0.0005	2.6	0.012	0.25	0.25
VNB4S	25/05/2018	30.6		2400	1400	300	1	32	330	0.025	540	0.5	580	2.5	480	110	21	65	310		0.0005	3.4	0.007	0.19	0.32	0.00005	0.004	0.013		6.4	0.00005	1.3	0.011	0.005	0.0005	1.5	0.024	0.25	0.25
VNB4D	25/05/2018	31.3		2000	1100	300	0.3	26	260	0.025	330	0.5	330	2.5	270	57	13	47	280		0.0005	0.031	0.002	0.18	0.39	0.00005	0.0005	0.001		0.35	0.00005	0.7	0.0005	0.0005	0.0005	1.6	0.0025	0.25	0.25
VNB4S	19/10/2018	30.57	7.5	2200	1400	290	0.9	30	300	0.11		0.5	560	2.5	460	110	21	69	290		0.0005	3.9	0.007	0.14	0.3	0.00005	0.005	0.016		7	0.00005	0.83	0.011	0.005	0.0005	1.3	0.021	0.25	0.25
VNB4D	19/10/2018	31.4	8	1900	1100	300	0.3	24	250	0.025		0.5	340	2.5	280	58	14	50	290		0.0005	0.032	0.003	0.22	0.35	0.00005	0.0005	0.0005		0.78	0.00005	1.2	0.0005	0.0005	0.0005	1.4	0.0025	0.25	0.25
AB1S	10/12/2018	23.6	7.9	4600	2900	950	0.8	19	640	0.28		0.5	510	2.5	420	70	47	90	710		0.002	0.4	0.003	0.037	0.87	0.00005	0.001	0.004		3.3	0.00005	0.085	0.003	0.0005	0.0005	2.1	0.013	0.25	0.25
AB1D	10/12/2018	22.6	8	4600	2900	940	0.8	19	640	0.17		0.5	510	2.5	410	67	46	91	730		0.0005	0.16	0.0005	0.032	0.97	0.00005	0.0005	0.003		0.26	0.00005	0.013	0.002	0.0005	0.0005	2.3	0.007	0.25	0.25
AB1S	25/06/2019	23.19		4800	2800	920	0.8	20	660	0.14	570	0.5	540	2.5	440	70	49	95	770		0.004	0.34	0.002	0.036	0.94	0.00005	0.001	0.004		2.2	0.00005	0.08	0.002	0.0005	0.0005	2.2	0.009	0.25	0.25
AB1D	25/06/2019	22.41		4800	2800	920	0.7	20	650	0.08	560	0.5	540	2.5	440	69	49	95	780		0.003	0.02	0.0005	0.024	0.96	0.00005	0.0005	0.0005		0.18	0.00005	0.006	0.0005	0.0005	0.0005	2.4	0.006	0.25	0.25
AB1S	25/06/2019	23.19		4800	2800	920	0.8	20	660	0.14	570	0.5	540	2.5	440	70	49	95	770		0.004	0.34	0.002	0.036	0.94	0.00005	0.001	0.004		2.2	0.00005	0.08	0.002	0.0005	0.0005	2.2	0.009	0.25	0.25
AB1D	25/06/2019	22.41		4800	2800	920	0.7	20	650	0.08	560	0.5	540	2.5	440	69	49	95	780		0.003	0.02	0.0005	0.024	0.96	0.00005	0.0005	0.0005		0.18	0.00005	0.006	0.0005	0.0005	0.0005	2.4	0.006	0.25	0.25
VNB4S	26/06/2019	29.98		2300	1300	290	1	31	320	0.06	570	0.5	600	2.5	490	110	22	73	290		0.0005	0.25	0.01	0.084	0.29	0.00005	0.0005	0.004		2	0.00005	0.77	0.003	0.0005	0.0005	1.3	0.008	0.25	0.25
VNB4D	26/06/2019	30.43		1900	1100	300	0.3	25	250	0.44	360	0.5	370	2.5	310	58	15	52	290		0.0005	0.33	0.002	0.17	0.33	0.00005	0.0005	0.009		0.46	0.00005	0.88	0.006	0.0005	0.0005	1.5	0.01	0.25	0.25
VNB4S	26/06/2019	30.43		2300	1300	290	1	31	320	0.06	570	0.5	600	2.5	490	110	22	73	290		0.0005	0.25	0.01	0.084	0.29	0.00005	0.0005	0.004		2	0.00005	0.77	0.003	0.0005	0.0005	1.3	0.008	0.25	0.25
VNB4D	26/06/2019	29.98		1900	1100	300	0.3	25	250	0.44	360	0.5	370	2.5	310	58	15	52	290		0.0005	0.33	0.002	0.17	0.33	0.00005	0.0005	0.009		0.46	0.00005	0.88	0.006	0.0005	0.0005	1.5	0.01	0.25	0.25
AB2D	19/05/2020			4800		950			670							73	51	90	770			0.02	0.001	0.084	0.83	0.0001	0.0001	0.002			0.0001	0.6	0.003	0.001			0.005	0.25	0.25
VNB1D	19/05/2020			2000		290			260							56	15	51	280			0.015	0.003	0.13	0.41	0.0001	0.0002	0.002			0.0001	0.74	0.003	0.001			0.005	0.5	0.5
AB2D	18/11/2020			4800		960			660							73	47	85	760			0.016	0.001	0.074	0.86	0.0001	0.0001	0.002			0.0001	0.56	0.002	0.0001			0.005	0.25	0.25
VNB1D	18/11/2020			2000		300			260							56	14	48	260			0.021	0.004	0.12	0.35	0.0001	0.0001	0.0001			0.0001	0.17	0.002	0.001			0.006	0.5	0.5
AB1S	26/05/2021	23.3	8	4700	2800	920	0.9	19	710	0.025	510	0.5	540	2.5	440	66	49	84	750		0.0005	0.006	0.0005	0.024	0.96	0.00005	0.003	0.0005	0.0005	0.069	0.000025	0.064	0.0005	0.0005	0.0005	2.3	0.017	0.5	0.5
VNB4S	26/05/2021	30.6	7.7	2300	1300	280	1	31	310	0.025	520	0.5	620	2.5	510	100	21	65	260		0.0005	0.0025	0.004	0.087	0.29	0.00005	0.005	0.0005	0.0005	0.78	0.000025	0.94	0.002	0.003	0.0005	1.3	0.022	0.5	0.5
AB1S	22/08/2021	23.22	7.9	4800	3000	930	0.8	20	670	0.001	530	0.5	530	2.5	430	68	47	87	750		0.0005	0.0025	0.0005	0.022	1	0.00005	0.016	0.0005	0.0005	0.1	0.000025	0.09	0.0005	0.0005	0.0005	2.4	0.035	0.5	0.5
VNB4S	22/08/2021	30.36	7.7	2300	1300	330	1	31	300	0.025	540	0.5	640	2.5	530	100	21	67	270		0.0005	0.0025	0.007	0.09	0.35	0.00005	0.002	0.0005	0.0005	0.99	0.000025	1.3	0.003

Groundwater Monitoring Bores

Cell is yellow where the limit of reporting (LoR) is halved

																																		Dissolved Gases		
	Units	ug/L	ug/L	ug/L	ug/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L
Bore Name	**Date Sampled**	**m,p-Xylene**	**ortho xylene**	**Toluene**	**Total Xylenes**	**TRH C6 - C9**	**C10 less BTEX (F1)**	**C6-C10**	**TRH C10-C14**	**TRH C15-C28**	**TRH C29-C36**	**TRH >C10 - C16**	**TRH > C10 - C16 less N**	**TRH >C_{16} - C_{34}**	**TRH >C_{34} - C_{40}**	**Total BTEX**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benzo(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b)fluoranthene**	**Benzo(b&j)fluoranthene**	**Benzo(g,h,i)perylene**	**Benzo(k)fluoranthene**	**Chrysene**	**Dibenzo(a,h)anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Phenanthrene**	**Pyrene**	**Total PAH**	**ethane**	**methane**	**propane**
AB1S	9/01/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
AB1D	9/01/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4S	9/01/2015	0.5	0.25	0.25		20	25		25	250	100	30		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.007	0.0025
VNB4D	9/01/2015	0.5	0.25	0.25		74	82		25	230	100	66		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4S	26/03/2015																																			
VNB4D	26/03/2015																																			
AB1S	27/03/2015																																			
AB1D	27/03/2015																																			
AB1S	19/05/2015																																			
AB1D	19/05/2015																																			
VNB4S	19/05/2015																																			
VNB4D	19/05/2015																																			
VNB4S	15/06/2015																																			
VNB4D	15/06/2015																																			
AB1S	16/06/2015																																			
AB1D	16/06/2015																																			
AB1S	19/07/2015																																			
AB1D	19/07/2015																																			
VNB4S	19/07/2015																																			
VNB4D	19/07/2015																																			
VNB4S	14/09/2015	0.5	0.25	0.25		20	25		25	250	100	30		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4D	14/09/2015	0.5	0.25	0.25		95	110		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.008	0.0025
AB1S	15/09/2015	0.5	0.25	0.25		20	25		25	100	360	30		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
AB1D	15/09/2015	0.5	0.25	0.25		20	25		25	100	350	30		250	250		0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
AB1S	2/10/2015																																			
AB1D	2/10/2015																																			
AB1S	13/10/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
AB1D	13/10/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4S	14/10/2015	0.5	0.25	0.25		20	25		25	240	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4D	14/10/2015	0.5	0.25	0.25		80	89		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4S	2/11/2015																																			
VNB4D	2/11/2015																																			
VNB4S	17/11/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4D	17/11/2015	0.5	0.25	0.25		81	90		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.013	0.0025
AB1S	18/11/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
AB1D	18/11/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4S	15/12/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4D	15/12/2015	0.5	0.25	0.25		72	83		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
AB1S	16/12/2015	0.5	0.25	0.25		20	25		130	940	350	300		980	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
AB1D	16/12/2015	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4S	27/01/2016	0.5	0.25	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.0025	0.0025
VNB4D	27/01/2016	0.5	0.25	0.25		58	67		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.013	0.0025
VNB4S	19/04/2016	4	2.3	7.7		45	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05				
VNB4D	19/04/2016	0.5	0.8	0.9		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05				
AB1S	20/04/2016	1	0.8	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05				
AB1D	20/04/2016	0.5	0.6	0.25		20	25		25	100	100	30		250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05				
AB1S	27/07/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
AB1D	27/07/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4S	28/07/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4D	28/07/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.008	0.0025
AB1S	10/12/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
AB1D	10/12/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4S	10/12/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4D	10/12/2016	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.007	0.0025
AB1S	23/05/2017	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.006	0.0025
AB1D	23/05/2017	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4S	24/05/2017	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.008	0.0025
VNB4D	24/05/2017	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.012	0.0025
AB1S	29/11/2017	0.5	0.25	0.25		20	25		25	100	490	30	30	250	660		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
AB1D	29/11/2017	0.5	0.25	0.25		20	25		92	100	790	30	30	510	1100		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0025	0.0025
VNB4S	30/11/2017	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.007	0.0025
VNB4D	30/11/2017	0.5	0.25	0.25		20	25		25	100	230	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.008	0.0025
AB1S	24/05/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.015	0.0025
AB1D	24/05/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.015	0.0025
VNB4S	25/05/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.043	0.0025
VNB4D	25/05/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.032	0.0025
VNB4S	19/10/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0184	0.0025
VNB4D	19/10/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0153	0.0025
AB1S	10/12/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.008	0.0025
AB1D	10/12/2018	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.0148	0.0025
AB1S	25/06/2019	0.5	0.25	0.25	0.75				25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.028	0.0025
AB1D	25/06/2019	0.5	0.25	0.25	0.75				25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.01	0.0025
AB1S	25/06/2019	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.028	0.0025
AB1D	25/06/2019	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.01	0.0025
VNB4S	26/06/2019	0.5	0.25	0.25	0.75				25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.021	0.0025
VNB4D	26/06/2019	0.5	0.25	0.25	0.75				25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.0025	0.05	0.0025
VNB4S	26/06/2019	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.021	0.0025
VNB4D	26/06/2019	0.5	0.25	0.25		20	25		25	100	100	30	30	250	250		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.0025	0.05	0.0025
AB2D	19/05/2020	1	0.25			20																														
VNB1D	19/05/2020	0.5	0.5			40																														
AB2D	18/11/2020	1	0.25			20																														
VNB1D	18/11/2020	0.5	0.5			40																														
AB1S	26/05/2021	0.5	0.5	0.5	0.5		5	5	5	25	25	5	5	25	25	0.5	0.5	0.5	0.5	0.5	0.5	0.5			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.001	0.0005	0.001
VNB4S	26/05/2021	0.5	0.5	0.5	0.5		5	5	5	25	25	5	5	25	25	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.001	0.0005	0.001
AB1S	22/08/2021	0.5	0.5	0.5	0.5		5	5	5	25	25	30	30	25	25	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.0005	0.0005	0.001
VNB4S	22/08/2021	0.5	0.5	0.5	0.5		5	5	10	25	25	40	40	25	25	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.0005	0.0005	0.001
AB1S	20/11/2021	0.5	0.5	0.5	0.5		5	5	5	25	25	5	5	25	25	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.001	0.0005	0.001
VNB4S	20/11/2021	0.5	0.5	0.5	0.5		5	5	5	25	25	5	5	25	25	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.001	0.0005	0.001
AB2D	7/05/2022	<0.001	<0.001	<0.001		<0.01	<0.01		<0.01	<0.05	<0.05	<0.01	<0.01	<0.05	<0.05	<0.001	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
VNB1D	6/05/2022	<0.001	<0.001	<0.001		<0.01	<0.01		<0.01	<0.05	<0.05	<0.01	<0.01	<0.05	<0.05	<0.001	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
AB2D	9/11/2022	<0.001	<0.001	<0.001		<0.01	<0.01		<0.01	<0.05	<0.05	<0.01	<0.01	<0.05	<0.05	<0.001	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
VNB1D	9/11/2022	<0.001	<0.001	<0.001		<0.01	<0.01		<0.01	<0.05	<0.05	<0.01	<0.01	<0.05	<0.05	<0.001	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			

Appendix K. Yungngora Groundwater Quality

Yungnora Community Bore YG2/18 monitoring data

Region	Community	Asset ID	Common Name	Sample Code	Lab ID	Sample date/ time (field)	Received date/time (Lab)	Asset type	Exclude from Reporting	Collection Month	Collection Year	Micro results	Chem results	Temperature Chilled (degrees C)	Temperature Amoeba (degrees C)	pH (field)	Chlorine Residual (ppm) (field)	Temperature at Collection (degrees C) (field)	E Coli (CFU/ 100mL)	Total Coliforms (CFU/ 100mL)	Thermotolerant coliform (CFU/100mL)	Thermophilic (/250mL) (CFU/100mL)	Naegleria	Speciation	Resample Amoeba	Anomoly Testing	Iron Oxidising (/200mL)	B. Pseudomallei (CFU/mL)	Bacteria	Shigella (/ 1000mL)	pH (Lab) | ADWG Aesthetic: 6.5 - 8.5	Turbidity (NTU) | ADWG Aesthetic:	Colour (Hazen) | ADWG Aesthetic: 5 NTU	15 HU	Conductivity @ 25 C	Total Dissolved Solids (mg/L) | ADWG Aesthetic: 600 mg/L	Alkalinity as CaCO3 (mg/L)	Hardness (mg CaCO3/L) | ADWG Aesthetic: 200 mg/L	Fluoride, F (mg/L) | ADWG Health: 1.5 mg/L	Chloride, Cl | ADWG Aesthetic: 2
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	L23-Ap0039276	18 Apr, 2023 07:40	18 Apr, 2023 23:00	Bore		4	2023	MICRO		2.8	27.6	7.6		49.0	0	0	0	0	0															
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	L23-Ap0039623	18 Apr, 2023 07:40	18 Apr, 2023 23:00	Bore		4	2023		6M	2.8																8.3		0.1	5	910.0	820	270	12	0.6
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-No0023205	9 Nov, 2022 07:45	9 Nov, 2022 22:22	Bore		11	2022	MICRO		5.1	28.4	7.4		49.2	0	6	4	0	0															
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-No0023389	9 Nov, 2022 07:45	9 Nov, 2022 22:22	Bore		11	2022		6M	5.1																8.6		0.1	5	990.0	580	240	8	0.6
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-Oc0023475	12 Oct, 2022 00:00	12 Oct, 2022 22:45	Bore		10	2022			2.6																								
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-02939.010	11 Apr, 2022 08:55	11 Apr, 2022 22:35	Bore		4	2022	MICRO		2.1	31.0	7.9		47.8	0	0	0	0	0															
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-Ap0025457	11 Apr, 2022 08:55	11 Apr, 2022 22:35	Bore		4	2022		6M	2.1																8.4		0.2	5	940.0	570	270	6	0.5
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-20088.017	10 Nov, 2021 07:09	10 Nov, 2021 22:45	Bore		11	2021	MICRO		4.6	31.1	7.1		41.1	0	0	0	0	0															
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-No25408	10 Nov, 2021 07:09	10 Nov, 2021 22:45	Bore		11	2021		6M	4.6																7.6		0.1	5	930.0	560	260	7	0.9
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-13052.001	14 Jul, 2021 07:28	14 Jul, 2021 07:28	Bore		7	2021			2.1	26.3																							
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-06658.038	13 Apr, 2021 08:10	13 Apr, 2021 22:50	Bore		4	2021	MICRO	6M	3.8	30.4	9.0		35.0	0	0	0			0						7.7		0.1	5	890.0	530	260	7	0.8

Yungnora Community Bore YG2/18 monitoring data

Region	Community	Asset ID	Common Name	Sample Code	Lab ID	Sample date/ time (field)	Received date/time (Lab)	Asset type	Exclude from Reporting	Collection Month	Collection Year	Micro results	Chem results	Temperature Chilled (degrees C)	Temperature Amoeba (degrees C)	pH (field)	Chlorine Residual (ppm) (field)	Temperature at Collection (degrees C) (field)	E Coli (CFU/ 100mL)	Total Coliforms (CFU/ 100mL)	Thermotolerant coliform (CFU/100mL)	l (mg/L) 50 mg/L	Nitrate as NO3 (mg/L) | ADWG Health: 50 mg/L	Nitrite as NO2 (mg/L) | ADWG Health: 3 mg/L	Sulfate, SO4 (mg/L) | ADWG Aesthetic: 250 mg/L	Sulfur, S (mg/L)	Sodium, Na (mg/L) | ADWG Aesthetic: 180 mg/L	Potassium, K (mg/L) (mg/L)	Calcium, Ca	Magnesium, Mg (mg/L) ADWG Health: 0.6 mg/L 4 mg/L	Suspended Solids | ADWG	Beryllium, Be (mg/L) Aesthetic: 0.2 mg/L Health:	Boron, B	Aluminium, Al (mg/L) | (mg/L)	| ADWG	(mg/L)	Reactive Silica, SiO2 (mg/L) | ADWG Aesthetic: 80 mg/L	Vanadium, Chromium, Cr6+, Cr (mg/L) | ADWG Health: 0.05 mg/L	Hexavalent V (mg/L)	Manganese, Mn (mg/L) | ADWG Health: 0.5 mg/L | ADWG Aesthetic: 0.1 mg/L	Iron, Fe (mg/L) | ADWG Aesthetic: 0.3 mg/L	Nickel, Ni (mg/L) | ADWG Health: 0.02 mg/L
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	L23-Ap0039276	18 Apr, 2023 07:40	18 Apr, 2023 23:00	Bore		4	2023	MICRO		2.8	27.6	7.6		49.0	0	0	0																							
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	L23-Ap0039623	18 Apr, 2023 07:40	18 Apr, 2023 23:00	Bore		4	2023		6M	2.8								150	0.0	0.05	1.0		250.0	5.2	3.7	0.6	5	0.001	0.27	0.05				29.0	0.005	0.002	0.042	0.03	0.001
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-No0023205	9 Nov, 2022 07:45	9 Nov, 2022 22:22	Bore		11	2022	MICRO		5.1	28.4	7.4		49.2	0	6	4																							
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-No0023389	9 Nov, 2022 07:45	9 Nov, 2022 22:22	Bore		11	2022		6M	5.1								140	0.1	0.05	1.0		220.0	4.7	3.4	0.5	5	0.001	0.20	0.05				28.0	0.005	0.002	0.030	0.02	0.001
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-Oc0023475	12 Oct, 2022 00:00	12 Oct, 2022 22:45	Bore		10	2022			2.6																												
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-02939.010	11 Apr, 2022 08:55	11 Apr, 2022 22:35	Bore		4	2022	MICRO		2.1	31.0	7.9		47.8	0	0	0																							
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-Ap0025457	11 Apr, 2022 08:55	11 Apr, 2022 22:35	Bore		4	2022		6M	2.1								130	0.0	0.05	1.0		150.0	4.3	2.1	0.3	5	0.01	0.22	0.01				21.0	0.01	0.002	0.030	0.05	0.001
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-20088.017	10 Nov, 2021 07:09	10 Nov, 2021 22:45	Bore		11	2021	MICRO		4.6	31.1	7.1		41.1	0	0	0																							
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-No25408	10 Nov, 2021 07:09	10 Nov, 2021 22:45	Bore		11	2021		6M	4.6								180	0.0	0.05	1.0		160.0	5.8	2.2	0.4	5	0.01	0.25	0.04				25.0	0.01	0.002	0.040	0.15	0.001
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-13052.001	14 Jul, 2021 07:28	14 Jul, 2021 07:28	Bore		7	2021			2.1	26.3																											
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-06658.038	13 Apr, 2021 08:10	13 Apr, 2021 22:50	Bore		4	2021	MICRO	6M	3.8	30.4	9.0		35.0	0	0	0	190	0.0	0.05	1.0		190.0	5.5	2.3	0.4	5	0.01	0.21	0.04				21.0	0.01	0.002	0.040	0.03	0.003

Yungnora Community Bore YG2/18 monitoring data

Region	Community	Asset ID	Common Name	Sample Code	Lab ID	Sample date/ time (field)	Received date/time (Lab)	Asset type	Exclude from Reporting	Collection Month	Collection Year	Micro results	Chem results	Temperature Chilled (degrees C)	Temperature Amoeba (degrees C)	pH (field)	Chlorine Residual (ppm) (field)	Temperature at Collection (degrees C) (field)	E Coli (CFU/ 100mL)	Total Coliforms (CFU/ 100mL)	Thermotolerant coliform (CFU/100mL)	Copper, Cu (mg/L) | ADWG Health: 2 mg/L | ADWG Aesthetic: 1 mg/L	Zinc, Zn (mg/L) | ADWG Aesthetic: 3 mg/L	Arsenic, As Health: 0.01 mg/L	Selenium, Se (mg/L) Health: 0.05	Molybdenum, Mo (mg/L) | Health:	(mg/L) | 0.01 mg/L	| ADWG mg/L	ADWG ADWG	Silver, Ag (mg/L) | ADWG Health: 0.1 mg/L	Cadmium, Cd (mg/L) | ADWG Health: 0.002 mg/L	Tin, Sn (mg/ L)	Barium, (mg/L) | ADWG Health: 0.001 mg/L	Mercury, Ba (mg/L) | ADWG Health: 2 mg/L	Hg	Lead, Pb (mg/L) | ADWG Health: 0.01 mg/L	Uranium, (mg/L) | ADWG L) 0.02 mg/L	Nitrite as N (mg/	Nitrate U as N (mg/L) Health:
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	L23-Ap0039276	18 Apr, 2023 07:40	18 Apr, 2023 23:00	Bore		4	2023	MICRO		2.8	27.6	7.6		49.0	0	0	0																
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	L23-Ap0039623	18 Apr, 2023 07:40	18 Apr, 2023 23:00	Bore		4	2023		6M	2.8								0.001	0.005			0.001	0.001		0.001	0.001		0.0001	0.001	0.04	0.0001	0.001	0.0010		
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-No0023205	9 Nov, 2022 07:45	9 Nov, 2022 22:22	Bore		11	2022	MICRO		5.1	28.4	7.4		49.2	0	6	4																
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-No0023389	9 Nov, 2022 07:45	9 Nov, 2022 22:22	Bore		11	2022		6M	5.1								0.002	0.005			0.001	0.001		0.001	0.001		0.0001	0.001	0.03	0.0001	0.001	0.0010		
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-Oc0023475	12 Oct, 2022 00:00	12 Oct, 2022 22:45	Bore		10	2022			2.6																							
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-02939.010	11 Apr, 2022 08:55	11 Apr, 2022 22:35	Bore		4	2022	MICRO		2.1	31.0	7.9		47.8	0	0	0																
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	22-Ap0025457	11 Apr, 2022 08:55	11 Apr, 2022 22:35	Bore		4	2022		6M	2.1								0.014	0.008			0.001	0.001		0.047	0.001		0.0001	0.01	0.03	0.0001	0.001	0.0010		
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-20088.017	10 Nov, 2021 07:09	10 Nov, 2021 22:45	Bore		11	2021	MICRO		4.6	31.1	7.1		41.1	0	0	0																
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-No25408	10 Nov, 2021 07:09	10 Nov, 2021 22:45	Bore		11	2021		6M	4.6								0.003	0.005			0.001	0.001		0.001	0.001		0.0001	0.01	0.04	0.0004	0.001	0.0010		
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-13052.001	14 Jul, 2021 07:28	14 Jul, 2021 07:28	Bore		7	2021			2.1	26.3																				0.001		
KIMB	Noonkanbah	33716	Bore YG2/18	ZB7/2675	21-06658.038	13 Apr, 2021 08:10	13 Apr, 2021 22:50	Bore		4	2021	MICRO	6M	3.8	30.4	9.0		35.0	0	0	0	0.150	0.110			0.001	0.001		0.001	0.001		0.0001	0.01	0.03	0.0001	0.013	0.0010		

Appendix L. Groundwater Modelling

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16 May 2024

Ashley Fertch
Director
Australasian Environmental Solutions
Perth, WA 6000

RE: Response to comments on the 3 October 2023 technical memorandum titled "Modelling of drawdown impacts from proposed rig supply bores in the Bennett Resources Valhalla Gas Development Project"

Dear Mr. Fertch,

In October of 2023 INTERA Geosciences Pty Ltd (INTERA) submitted the above-referenced memo (the "original memo") to Australasian Environmental Solutions (AES). In March of 2024 INTERA received a set of comments generated by an independent review of the memo by an external reviewer. The specific comments received are as follows:

1. *The model has several parameter assumptions and many limitations.*
    a. *Can the parameters and assumptions be clearly stated. Specifically, can a sensitivity analysis be conducted for these parameters [aquifer/aquitard thickness, hydraulic conductivity, aquifer thickness, storage] (i.e. increase/ decrease the values and run multiple options through the model to understand the impact of these assumptions)*
    b. *Can a number of extraction rates be studied to understand impacts of varied extraction rates.*
    c. *Can the limitations be described and justified why they are suitable for the purpose of this analysis.*
    d. *Justify why only single model layers are suitable (rather than multiple layers) and validate this against the vertical stratigraphy.*
2. *AES has been informed that MODFLOW 2005 may be outdated and have been informed other software is available (MODFLOW version includes MODFLOW-6, MODFLOW-USG, MODFLOW-SURFACT). Is it possible to provide a justification as to the software suitability for the scope?*

The attached memo titled "Revised modelling of drawdown impacts from proposed rig supply bores in the Bennett Resources Valhalla Gas Development Project" (the "revised memo") contains an updated modeling evaluation prepared in response to the review comments. This letter summarizes the updated modeling and analysis done to address those comments.

Model Software Update

Comment 2 noted that the model was prepared using MODFLOW-2005 rather than one of the later editions of the modeling software. MODFLOW-2005 was chosen because it is an appropriate model for the scope of the problem (i.e., simulating drawdowns in an aquifer for a specific pumping scenario for both confined and unconfined conditions). The subsequent versions of the modeling software, including the latest MODFLOW version (MODFLOW 6), include the same basic modeling techniques used to simulate drawdown and contain significant modeling capabilities that are not specifically applicable to the problem addressed in the memo, therefore, the use of MODFLOW 6 or any of the other software packages listed were not considered.

In response to this comment, the model developed for the original memo was ported to the MODFLOW 6 software environment and the original models simulations were performed. Updated drawdown maps and a discussion of the results are presented in Section 5 of the revised memo. In summary, all model results are essentially equivalent to the previous results. For the Liveringa simulation the modeled drawdowns at all existing bores were less than <0.01 m and the production wells were capable of producing the required amounts with drawdowns that are much less than the available saturated thickness. For the Grant/Poole simulation, the modeled drawdowns at all existing bores were less than 0.4 m and the production wells experienced drawdowns of less than a meter.

Model Input Parameter Justification

Comment 1 discusses input parameter assumptions and requests justifications for the assumptions and parameters used in the model. The requested discussions are included in the revised memo in a new section called **Section 6.0 Modeling Limitations and Sensitivity Analysis**. This section includes a discussion of model limitations and the appropriateness of using single layer models rather than multi-layer models.

Model Sensitivity Analysis

Comment 1 also includes a request for a model sensitivity analysis to evaluate model sensitivity to reasonable ranges of input parameters as well as various extraction rates. A sensitivity analysis was performed using the revised MODFLOW 6 version of the models. The sensitivity analysis uses a variety of extraction rates that range from 50% to 300% of the expected extraction rates, with the overall pumping time (182 days) held constant. For the Liveringa unconfined model the sensitivity to variations in hydraulic conductivity and specific yield were investigated. Hydraulic conductivity values were varied over 5 orders of magnitude (0.00001 to 0.1 m/d) to match the reported range of values presented in the original memo. The results from the original simulations were included in the analysis for comparison. The approach and results are also presented in Section 6 of the revised memo.

Summary of Results for Revised Memo

Model simulations with the updated model software successfully reproduced the results from the original memo. The sensitivity analysis indicates that some of the unconfined aquifer simulations with the most restrictive input parameters indicate that the Liveringa formation may not be able to sustain 100% of the required pumping rates; however, these simulations assume a conservative pumping approach (i.e., all wells pumping at the same time and at maximum rates rather than pumping staggered throughout the gas production well development period) so these simulations

are not interpreted to indicate that the proposed well production from the shallow unconfined system is not viable. All simulations for the confined Grant/Poole system indicate that the aquifer is capable of supplying the required volume of water, and most simulations other than the lowest ranges of T and S with pumping rates greater than 100% of the required volume indicate minimal impact to existing bores.

If you have any questions or require further information, please contact me at muliana@intera.com or 0450 971 620.

Sincerely,

INTERA Incorporated

Matthew Uliana, Ph.D., P.G.
Principal Hydrogeologist

Enclosure

INTERA Geosciences Pty Ltd
300 Murray Street Level 2 East
Perth, WA 6000 Australia

TECHNICAL MEMORANDUM

To: Ashley Fertch
Marnie Leybourne
Australasian Environmental Solutions

From: Matthew Uliana, PhD, PG
Principal Hydrogeologist

Date: 16 May 2024

Re: Revised modelling of drawdown impacts from proposed rig supply bores in the Bennett Resources Valhalla Gas Development Project

1.0 Introduction

As requested, INTERA has prepared the following groundwater model-based evaluation of potential aquifer drawdowns and well interference at the proposed Valhalla site near Fitzroy Crossing, WA. It is our understanding that 20 hydrocarbon exploration wells across 10 well sites are proposed (**Figure 1-1**) with two water production bores installed at each wellsite for rig supply. The overall extent of the development is indicated on Figure 1-1 as the Development Envelope (also referred to in this report as the "project site"). Bennett Resources is proposing to undertake an unconventional exploration drilling and hydraulic fracture stimulation program within the study area targeting hydrocarbons in the Laurel Formation at depths ranging from 2,000 meters (m) to 4,000 m below ground level (bgl). The rig supply bores will provide water for hydraulic fracturing and well construction.

The expected total demand from the rig supply bores at any at each well site is 33,400 kiloliters (kL) produced over a 6-month (182-day) period, which equates to a consistent pumping rate of 183.52 cubic meters per day (m^3/d) for 182 days. It is also assumed that the rig supply bores will not represent an on-going demand upon the system, therefore, the groundwater models developed here only simulate a 182-day pumping period with an additional 270-day post-pumping recovery period. The models also assume that all ten sets of rig supply bores will operate concurrently. This is assumed to be a somewhat conservative approach as the wells will likely be installed in stages and there could be times when some rig supply bores are decommissioned before others are brought on-line.

The specific objective of the modelling is to estimate aquifer drawdowns induced by the rig supply bores and determine if there is a risk of groundwater production from the rig supply bores impacting existing bores in the area, creating excessive bore interference, or causing environmental impact to local groundwater dependent ecosystems (GDE).

2.0 Site Hydrogeology and Conceptual Model

The site sits near the northeast flank of the Fitzroy Trough within the Canning Basin geological region (**Figure 2-1**). The surface geology for the Canning Basin (**Figure 2-2**) indicates that the middle-to-late Permian Liveringa Group aquifer system is exposed at the surface at and around the project site. The Liveringa Group is comprised mostly of siltstone and limestone but also contains minor sandstone and thin coal beds (Lindsay and Commander, 2005). The Liveringa group is considered unconfined with some localized semi-confining units. The Liveringa is underlain by a regional aquitard called the Noonkanbah Formation, which overlays the Poole

Sandstone, which in turn overlays the Grant Group. The Grant Group and Poole Sandstone are both considered to be regional aquifer systems that are generally confined by the Noonkanbah Formation. For this evaluation, they are grouped together as a single aquifer unit. A block diagram showing the relationship between the aquifer formations within the Fitzroy Trough are shown on **Figure 2-3**, with a general location of the section line for the edge of the diagram on Figure 2-2. The Liveringa Group and the Grant/Poole aquifer systems are considered for this study in the event that both aquifers could supply water for the rig supply bores.

The potentiometric surface for the Grant/Poole aquifer system (**Figure 2-4**) indicates that hydraulic heads in the Development Envelope are 75-100 mAHD with a regional gradient from southeast to northwest. Ground surface elevations within the Development Envelope range from about 80 mAHD in the southwest corner to 145 mAHD along the northeast boundary; therefore, typical depths to groundwater in the Grant/Poole aquifer system are 5 to 45 m below ground surface (bgs). The potentiometric contours also suggest that groundwater is discharging to the mainstem and some tributaries of the Fitzroy River. A detailed study of groundwater-surface water interactions in an approximately 100-km reach of The Fitzroy River running to the south of the project site was presented in Harrington et al. (2011). Harrington et al. (2011) determined that The Fitzroy River is a gaining stream system that receives about 102 ML/day of groundwater inflow, with most of this flow (98.3 ML/d) derived from local sources representing recent recharge and shallow flow system. Harrington et al. (2011) also determined that fault zones in the system are providing preferential pathways for discharge from the deeper Grant/Poole system into the surface waters, which confirms that discharge is occurring from the Grant/Poole into the surface waters.

A regional potentiometric surface for the Liveringa is not available. Harrington et al. (2011) indicate that groundwater flow in the Liveringa is likely controlled locally by flow to surface waters in the Fitzroy River catchment with regional westward gradients like those in the Grant/Poole system.

Water quality data presented in Taylor et al. (2021) is relatively sparse for the aquifers near the project site, and there is insufficient data or information to determine if there are vertical interactions between the two formations or to develop aquifer parameters to model any vertical flows between the aquifers. For the evaluation described here, the two formations are assessed separately, and it is assumed that any vertical flows induced by pumping on one aquifer will not result in long-term impacts to the other aquifer.

The primary GDEs that could potentially be impacted by pumping from the proposed rig supply bores are associated with the main stem and tributaries of The Fitzroy River, with specific focus on Mount Hardman Creek given its proximity to the proposed rig sites. The proposed rig sites are all greater than 20 km from The Fitzroy River, and it is unlikely that temporary groundwater production from those bores will have any significant impact on GDEs associated with the Fitzroy River. Mount Hardman Creek is located approximately 1km away from the Muspelheim rig site and as such this well will be evaluated using the models described in subsequent sections.

3.0 Modelling Approach

A set of numerical groundwater models were developed using MODFLOW 6[1]. The Groundwater Vistas (ESI) modeling software was used to develop the input files and process model output. Two primary models were developed, one simulating the unconfined Liveringa Group (Mod 1) and one simulating the confined Grant/Poole aquifer system (Mod 2). Each model included a single

[1] https://www.usgs.gov/software/modflow-6-usgs-modular-hydrologic-model

model layer, with Mod 1 assigned an unconfined layer condition and Mod 2 assigned a confined layer condition. Each model grid shared the same footprint, with a 1000 x 1000-meter row and column spacing that was refined to about 62 x 62 m spacing within the development envelope using quadtree mesh refinement (**Figure 3-1**). Grid refinement within the development envelope was used to allow for more precise representation of the modeled impacts from the proposed rig supply bores.

The south and west boundaries in each model were assigned CH model cells (Figure 3-1) with heads designed to develop a similar hydraulic gradient as presented in Figure 2-4. Since the actual drawdown impacts presented in Section 5 below are very small and localized, it is assumed that the regional hydraulic gradients won't have a significant effect on drawdowns around the project site; therefore, the model is not expected to be particularly sensitive to the regional gradient. For Mod 1, a set of boundaries simulating Fitzroy Creek (Figure 3-1) were included with elevations based on the typical stage elevations obtained from Google Earth. These cells were not included in Mod 2. The model assumes that the northeast and southwest boundaries of the model domain are no-flow boundaries which are determined by the extent of active model cells (Figure 3-1).

The Liveringa Group aquifer is unconfined; therefore, the

saturated thickness of the Liveringa is the difference between the water table elevations and the elevations of the base of the aquifer. Water levels for the Liveringa are not available. Taylor et al. (2021) indicate that groundwater in the Liveringa is generally flowing in a westerly direction with discharge to the Fitzroy River. Pre-development water levels in the aquifer were based on Fitzroy River stage elevations and a general westerly hydraulic gradient. Static water levels for Mod 1 were estimated based on a steady-state model simulation dependent upon Fitzroy River stage elevations, which results in Liveringa water levels ranging from about 70 to 85 mAHD at the project site. These values are slightly lower than the values of 75 to 100 mAHD for the Grant/Poole system presented in Taylor et al. (2021; see Figure 2-4), which is consistent with upward hydraulic gradients in the system identified by Taylor et al. (2021).

The elevation of the base of the Liveringa within the Fitzroy Trough ranges from -84 to -171 mAHD (Rockwater, 2016). A representative value of -100 mAHD was therefore assigned to Mod 1. This indicates that the initial saturated thickness of the LIveringa within the development envelope is about 170 to 185 meters.

The Grant/Poole aquifer system is assumed to be confined throughout majority of the model domain and is therefore simulated in Mod 2 using a single model layer assigned a confined layer condition. The thickness and elevations of the aquifer system are variable and are not known at the project site; therefore, the aquifer is simulated assuming a constant transmissivity rather than a hydraulic conductivity and thickness. Transmissivity is defined as the product of the hydraulic conductivity and the saturated thickness. Transmissivity estimates were based on ranges of values presented in Taylor et al. (2021) as discussed below in Section 4.

An attempt was made to incorporate recharge into Mod 1 using the mean recharge estimate of 1.8 mm/yr presented in Taylor et al. (2021) calibrated to estimated groundwater discharge to the Fitzroy River (~100 ML/d over a 100 km reach) by varying hydraulic conductivity in a steady-state version of the model. The results indicate that, given the assumed geometry of the system, the regional hydraulic conductivity of the Liveringa would need to be unrealistically high to match the expected groundwater discharge rate and produce a reasonable water table in the model. Recharge was therefore not included in the final predictive model. This is considered acceptable

as it provides a more conservative estimate of the potential impacts from the proposed pumping bores.

4.0 Model Inputs

4.1 Aquifer parameters for the Liveringa (Mod 1)

Hydraulic conductivity (K) values for the Liveringa Group formations as presented in Taylor et al. (2021) range from 3.25 x 10^{-5} to 0.0913 m/d. Rockwater (2016) used model calibration to drawdown data from nearby pumping bores to determine a representative K of 0.05 m/d for the Liveringa. This value is at the higher end of the range presented in Taylor et al. (2021), which is consistent with the high K values suggested by our attempted calibration to recharge and discharge estimates for the aquifer. A K of 0.05 m/d was therefore assumed for Mod 1.

Taylor et al. (2021) present porosity estimates for various formations in the Fitzroy Trough and assume a representative porosity of 0.05 for the Liveringa Group. This is equal to the value for specific yield (Sy) used by Rockwater (2016) for their Liveringa drawdown model. A Sy of 0.05 was therefore assumed for Mod 1.

4.2 Aquifer parameters for the Grant Group/Poole (Mod 2)

Thickness variations are uncertain in the Grant/Poole aquifer system; therefore, the Grant/Poole system was modeled assuming a homogeneous transmissivity (T) rather than hydraulic conductivity and thickness. Taylor et al. (2021) indicates T values from aquifer tests ranging from 6 to 525 m^2/d. A representative regional transmissivity for the aquifer is likely in the middle to upper part of this range of values; therefore, an intermediate value of 265 m^2/d was applied to the predictive model.

Mod 2 assumes a fully confined aquifer condition for the active model layer; therefore, the relevant aquifer storage coefficient is the storativity (S), which is defined as the product of the saturated thickness and the specific storage (Ss). Taylor et al. (2021) states that, for the Poole sandstone, "…specific storage has been derived for one location and is 0.001." This statement is assumed to be a typographical error as a) specific storage should have units of 1/length (e.g., 1/m) and b) a value of 0.001 is reasonable for S (which is a dimensionless quantity) for a sandstone aquifer but is 2 to 4 orders of magnitude too high for a reasonable specific storage value in a confined sandstone. This value is therefore assumed to represent the measured value for storativity and was therefore assigned to the Grant/Pool aquifer system model.

4.3 Predictive Simulations

The predictive models were set up with a ~6-month (182-day) stress period with active pumping and a ~9-month (270-day) recovery period with no pumping. Pumping was applied to each of the rig site locations shown in Figure 1-1 at 183.516 m^3/d, which is the rate required to produce a total of 33,400 kL over a 182-day period.

5.0 Model Results

Model results are presented as mapped drawdown contours with a minimum contour of 0.2 meters and a 0.2-m contour interval. Drawdown is defined as the change in water levels within the aquifers (i.e., below ground surface) that results from pumping of the proposed production wells. The value of 0.2 was chosen for the minimum because normal seasonal fluctuations are likely on the order of 0.2 to 1 m; therefore, any values less than 0.2 m are likely not significant

relative to natural variations. Locations of known existing bores within and near the project site are also shown on the maps of model results to determine potential impact to existing bores.

Figure 5-1 shows modeled drawdowns at the end of the 6-month pumping period for Mod 1. Modeled drawdowns at the pumping bores range from 7.3 m to just under 8 m. The radius of the 0.2-m drawdown contour for each bore is within 500 m of each pumping bore. All 0.2-m drawdown contours are greater than a kilometer from any existing bores in the project area. Mod 1 indicates that production of the required volumes of water should not result in any observable impacts to existing bores.

Figure 5-2 shows modeled drawdowns at the end of the 6-month pumping period for Mod 2. The 0.2 m contour interval extends throughout much of the project site and encompasses two of the known existing bores in the project area. Model-predicted drawdowns at those bores range from 0.2 to 0.3 m, which is smaller than the normal seasonal variations in water levels and which represents a very small percentage of the available water column in each bore. Drawdowns in the bores that exceed 0.2 m recover to residual drawdowns between 0.08 and 0.16 m within nine months of the end of pumping.

An additional set of predictive model simulations for both Mod 1 and Mod 2 were performed with pumping only applied to the Muspelheim well location (labeled “Mus” on Figure 1-1). These simulations were performed to determine the radius of impact from an individual bore for each model. Model results are presented as distance-drawdown plots showing modeled drawdown after 6 months of continuous pumping at 183.516 m^3/d. Model results are presented in **Figure 5-3**. As indicated by **Figure 5-3A**, modeled drawdowns for Mod 1 (Liveringa aquifer) are 0.2 m at about 350 m from the pumping well, less than 0.1 m at just over 400 m from the pumping well, and less than 3E-06 m at 1,000 m from the pumping well. Model-calculated drawdowns in the Liveringa within 1-km of the Mus well for the single pumping well simulation are identical to the drawdowns from the simulation with all well locations pumping, which indicates that production from the rig supply bores at the expected rates will not result in inter-well drawdown interference. As indicated by **Figure 5-3B**, modeled drawdowns for Mod 2 (Grant/Poole aquifer) are 0.2 m at 3.25 km from the pumping well and 0.1 m at just over 10 km from the pumping well (Figure 5-3B).

The model results presented in Figures 5-1 through 5-3 suggest that the Liveringa aquifer should experience greater drawdowns at each well but with a much more limited extent of drawdown impact in the aquifer as compared to the Grant/Poole aquifer. This is consistent with the assumptions built into the model, as the Grant/Poole aquifer is expected to have a much higher hydraulic conductivity (which would result in less impact at the pumping wells) with a much lower storage coefficient associated with confined condition (which would result in a greater areal extent to drawdown impacts). In general, this result is expected as drawdowns in an unconfined aquifer (like Mod 1) are related to the production wells temporarily draining water out of the aquifer pore space right next to the well while production wells in a confined aquifer (like Mid 2) are temporarily depressurizing the aquifer, which will affect a larger area but result in smaller drawdowns at the actual wells.

6.0 Modeling Limitations and Sensitivity Analysis

The objective of the modelling presented here is to simulate pumping-induced drawdowns in an aquifer given a relatively short-term pumping period (~6 months) and general assumptions about the aquifer input parameters. The modelling software used for the simulations (MODFLOW) is an industry standard program that has been developed over 4 decades and that has been verified as an appropriate tool for simulating aquifer drawdowns in response to pumping.

A review of available literature and other data on the geology and hydrogeology of the study area indicates that there are two potential target aquifers at the site – the unconfined Liveringa and the underlying confined Grant/Poole. There is a considerable amount of uncertainty about groundwater conditions, boundary conditions, and aquifer parameters and parameter variability at the site, which in turn creates predictive uncertainty in the models. The uncertainty associated with critical aspects of the model and the approaches used for dealing with that uncertainty are discussed here.

6.1 General Modelling Approach

The total pumping demand built into the model assumes ten (10) rig supply bores each producing a given amount (33,400 kL) over a time period intended to represent the time required to install the associated hydrocarbon exploration bores (6 months) at each wellsite. For all simulations the modelling assumes that all 10 rig supply wells start pumping at the same time and operate concurrently for the same 6-month period. This is considered to be a conservative approach that results in a "worst-case" pumping application scenario as the actual exploration bores will likely be installed in stages over a multi-year period, which in turn would mean that rig supply bores will come on- and off-line over an extended period. This conservative approach helps to mitigate the uncertainty associated with other model inputs as the simulations are applying a much greater stress to the aquifer than what it will actually experience.

The system was modelled with individual one-layer models for each aquifer system rather than an integrated multi-layer model with some limitations on vertical inter-formational flows (e.g., an aquiclude or vertical anisotropy). The primary reason for this is because there is not enough available information in the literature and existing data to characterize inter-formational flows and verify that a modelling approach is adequately simulating reality. Using individual one-layer models and applying all expected pumping to each model results in a more conservative model as any interformational flows would likely result in additional water moving into the pumped formation, which in turn will reduce modelled drawdowns. This approach is therefore considered to be a conservative approach that will overstate actual aquifer drawdowns.

6.2 Boundary Conditions

Estimates of aquifer recharge to the unconfined system are available for the study area (see Section 3); however, there is considerable uncertainty associated with those estimates. Since applying recharge to the unconfined model would result in reductions to the modelled drawdowns, recharge was not included in the final modelling to create a more conservative estimate of predictive drawdowns.

Other model boundary conditions, such as the constant head cells to the south and west and the lateral no-flow boundaries to the northeast and southwest are positioned far enough from the Development Envelope that they do not have any notable impact on drawdowns within the study area.

6.3 Aquifer Parameters

Mod 1 assumes unconfined aquifer conditions; therefore, the hydraulic conductivity (K) and the specific yield (Sy) are the key aquifer parameters for that model. Mod 2 assumes confined aquifer conditions; therefore, the transmissivity (T) – which is the product of the hydraulic conductivity and the saturated thickness – and the storativity (S) – which is the product of the elastic storage coefficient and the saturated thickness – are the key aquifer parameters for that model. Estimates of appropriate values for these parameters, as derived from the available literature, are presented in Section 4.

The estimates presented for K and T in each aquifer system are broad ranges of values that cover several orders of magnitude. For the storage parameters there are very few estimates that generally cover typical values for the aquifer conditions and lithologies present at the site. The uncertainty associated with aquifer parameters is addressed through a model sensitivity analysis that involves a large number of simulations with variations in permeability, storage parameters, and pumping rates, with results presented as drawdown statistics for the proposed production bores and existing off-site bores.

6.3.1 Sensitivity Analysis – Mod 1

Table 6-1 shows a summary of the input values for the sensitivity analysis simulations for Mod 1. The input parameters varied include the total pumping rates, with four sets of pumping rates equivalent to 50%, 100%, 150%, and 300% of the expected rates described in Section 1 (183.52 m^3/d per well over 6 months); three sets of K values ranging from 1.0E-05 to 1.0E-01 m/d; and three sets of Sy values ranging from 0.01 to 0.3.

Sensitivity analysis results for Mod 1 are presented in Table 6-1. The column “Avg at Pumping Bores” in Table 6-1 contains the average modelled drawdowns at the actual pumping bores at the end of the pumping period in each simulation. As indicated on Table 6-1, drawdowns at the pumping wells are sensitive to variations in K with significantly larger drawdowns at the lower K values. For the simulations at 50% or 100% of expected pumping, the lower K models result in relatively large (~20-60 m) drawdowns at the pumping wells, however, these values are still less than the assumed initial saturated thickness (~170-185 m). There is some uncertainty in the actual saturated thickness at the site; however, even if it is half of the assume thickness (85-90 m) the modelled drawdowns from the models with 50-100% of expected pumping will not exceed the available.

At the highest pumping rates, the modeled drawdowns can be a significant fraction of available saturated thickness; therefore, greater pumping rates will only be sustainable if the K values are similar to those assumed for the models presented in Section 4 and 5.

For all 36 simulations the modeled drawdowns at each existing bore (see Figure 5-1 for existing bore locations) were 0.01 m or less, which is considered to be less than the resolvable precision of the model and is interpreted to indicate no impact from pumping on existing bores. This suggests that, even with the most conservative conditions, pumping from the proposed bores completed in the unconfined system will not result in any observable impacts to existing bores.

6.3.2 Sensitivity Analysis Results – Mod 2

Table 6-2 shows a summary of the input values for the sensitivity analysis simulations for Mod 2. The input parameters varied include the same ranges of total pumping rates; three sets of T values ranging from 10 to 1,000 m^2/d, and three sets of S values ranging from 1.0E-04 to 1.0E-02.

Sensitivity analysis results for Mod 2 are presented in Table 6-2. The column “Avg at Pumping Bores” in Table 6-2 contains the average modelled drawdowns at the actual pumping bores at the end of the pumping period in each simulation. As indicated on Table 6-2, drawdowns at the pumping wells are sensitive to variations in both T and S, though the differences in drawdowns at the lower values are not as significant as those indicated in Mod 1. Overall drawdowns at the pumping bores are not as extreme as those observed in Mod 1 and given that the expected completion depths for production bores in the Grant/Poole aquifer will be much deeper than those in the Liveringa (likely >200 m below ground level), the model simulations indicate that there will be sufficient available water column in the production bores for even the lowest expected aquifer parameters.

The columns containing "… at Existing Bores" in Table 6-2 contain general statistics for the modelled drawdowns at the existing bores shown in Figure 5-2. Drawdowns at existing bores are less than 4.5 m for all simulations at 50-100% of expected pumping, with all models but the lowest S values resulting in drawdowns less than 1 meter. The models indicate that the greatest sensitivity is to storativity, with the lowest S values generally resulting in drawdowns greater than a meter throughout the Development Envelope. These results indicate that there could be some risk of impact to existing bores if the actual aquifer parameters in the Grant/Poole are much lower than expected; however, those impacts will certainly be minimized if pumping from the production bores is distributed over time as expected.

7.0 Conclusions and Proposed Future Work

The results of Mod 1 indicate that production of the required water volumes from the Liveringa Group will not result in any noticeable impact to existing bores at the project site. The nearest GDE (Mt. Hardman Creek) is also too far from the nearest proposed rig site to experience any significant impacts from the proposed project.

The results from Mod 2 indicated that production of the required water volumes from the Grant/Poole aquifer system would potentially induce temporary drawdowns between 0.2 and 0.4 m on a small number of existing bores at the project site. These drawdowns will likely recover within a year after the end of the pumping period. The impacts represent a very small percentage of the available water column in each bore and would likely not induce any practical impact on the operation of the existing bores.

Hydraulic heads in the Grant/Poole system are higher than those in the overlying Liveringa, which suggests that there could be vertical upward flow of groundwater between the two systems. The evaluations presented by Harrington et al. (2011) also indicate that there is some flow moving up along fault zones and discharging into the Fitzroy River. There is insufficient data to adequately model any interactions between the two aquifer systems; therefore, this was not included in the modeling analysis. Due to the short-term nature of the proposed pumping and the relatively small impacts on each aquifer from pumping within each aquifer, it is unlikely that there would be significant cross-formational impacts from pumping in either aquifer.

Sensitivity analysis of the critical input parameters for Mod 1 indicates that there is very little risk of pumping from the Liveringa affecting any existing bores; however, the aquifer may not be able to support production at higher pumping rates. All Mod 1 sensitivity analysis simulations resulted in modeled drawdowns at the existing bores that are so small they are likely beyond the reasonable resolution of the modelling.

The Mod 2 (Grant/Poole aquifer) sensitivity analysis indicates that the aquifer should not have any problem supplying the required water even at 3 times the expected rates; however, the Grant/Poole aquifer model is sensitive to variations in model storativity and lower than expected storativity in the actual aquifer could result in existing bores temporarily experiencing 1 to 15 m of drawdown by the end of the 6-month pumping period. Drawdown contours were not generated for each of the sensitivity analysis simulations; however, the drawdown statistics presented in Section 6 indicate that typical drawdowns at existing wells for the 100% demand simulations are much less than 1 meter for all but the most restrictive input parameters.

Groundwater levels at each site are generally within 5-45 m of ground surface and each aquifer should have well over 100 m of saturated thickness (i.e., water level in wells above the base of the aquifer) available for drawdown. The modeled drawdowns for all sensitivity analysis

simulations, therefore, are expected to be a small percentage of the available drawdowns, which in turn indicates that the modelled impacts are relatively small.

The analysis presented here is conservative for several reasons:

- The modeling approach assumes that to all rig supply bores pumping concurrently, which will likely not happen as construction of the wells will likely be staged over time.
- The required pumping involves producing a finite volume of water over a relatively short period of time. Any observed impacts at existing pumping bores should recover to pre-pumping rates within a year of the end of pumping.
- Recharge is not included in any of the model simulations. Adding recharge to the system would reduce modeled impacts from pumping.
- The models assume that all pumping is applied to either the Liveringa or the Grant/Poole. If the required pumping is distributed between the two formations, the overall impacts to each formation will be reduced.

The modeling presented here was developed using data and information from the literature with no site-specific testing or investigations. Aquifer testing, including step-drawdown and constant rate pumping tests, should be performed on each of the groundwater extraction bores shortly after installation and development are completed. If possible, at least one monitoring bore should be installed close enough to a production bore to allow for at least one multi-bore aquifer test to establish storage parameters at the site. The results of site-specific testing should then be used to refine the model calculations and develop more reliable estimates of future impacts at the site.

8.0 References

Harrington, G.A., Stelfox, L., Gardner, W.P., Davies, P., Doble, R. and Cook, P.G. 2011. Surface water – groundwater interactions in the lower Fitzroy River, Western Australia. CSIRO: Water for a Healthy Country National Research Flagship. 54 pp.

Lindsay, R.P. and Commander, D.P., 2005. Hydrogeological Assessment of the Fitzroy Alluvium, Western Australia, Department of Water, Hydrogeological Record Series HG 16., https://www.water.wa.gov.au/__data/assets/pdf_file/0018/4824/77811.pdf.

Rockwater, 2016. Hydrogeological Assessment of Paradise–Valhalla–Asgard Project Areas; Report No. 416.0/16/04b prepared for Buru Energy, 26 p. plus Appendix I.

Taylor, A.R.; Barron, O.V.; Mule, S.; and Ibrahimi, T.; 2021. Groundwater baseline review of the Canning Basin, Western Australia. A technical report from CSIRO to GISERA. CSIRO Technical Report EP2021-1700; CSIRO, Australia. https://doi.org/10.25919%2Fwsky-g072

Figures

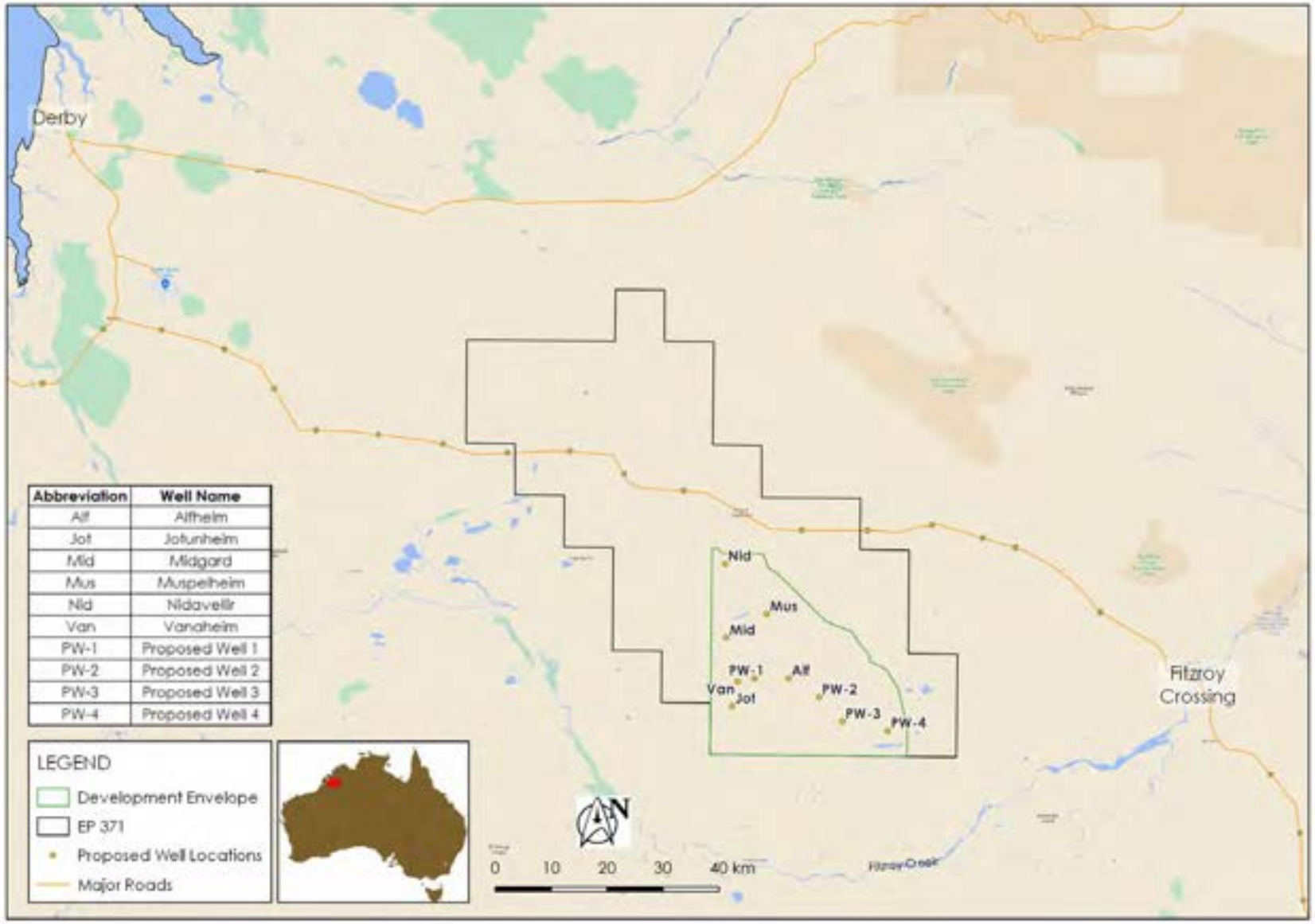


Figure 1-1. Map of the overall study area and locations of the proposed gas production wells

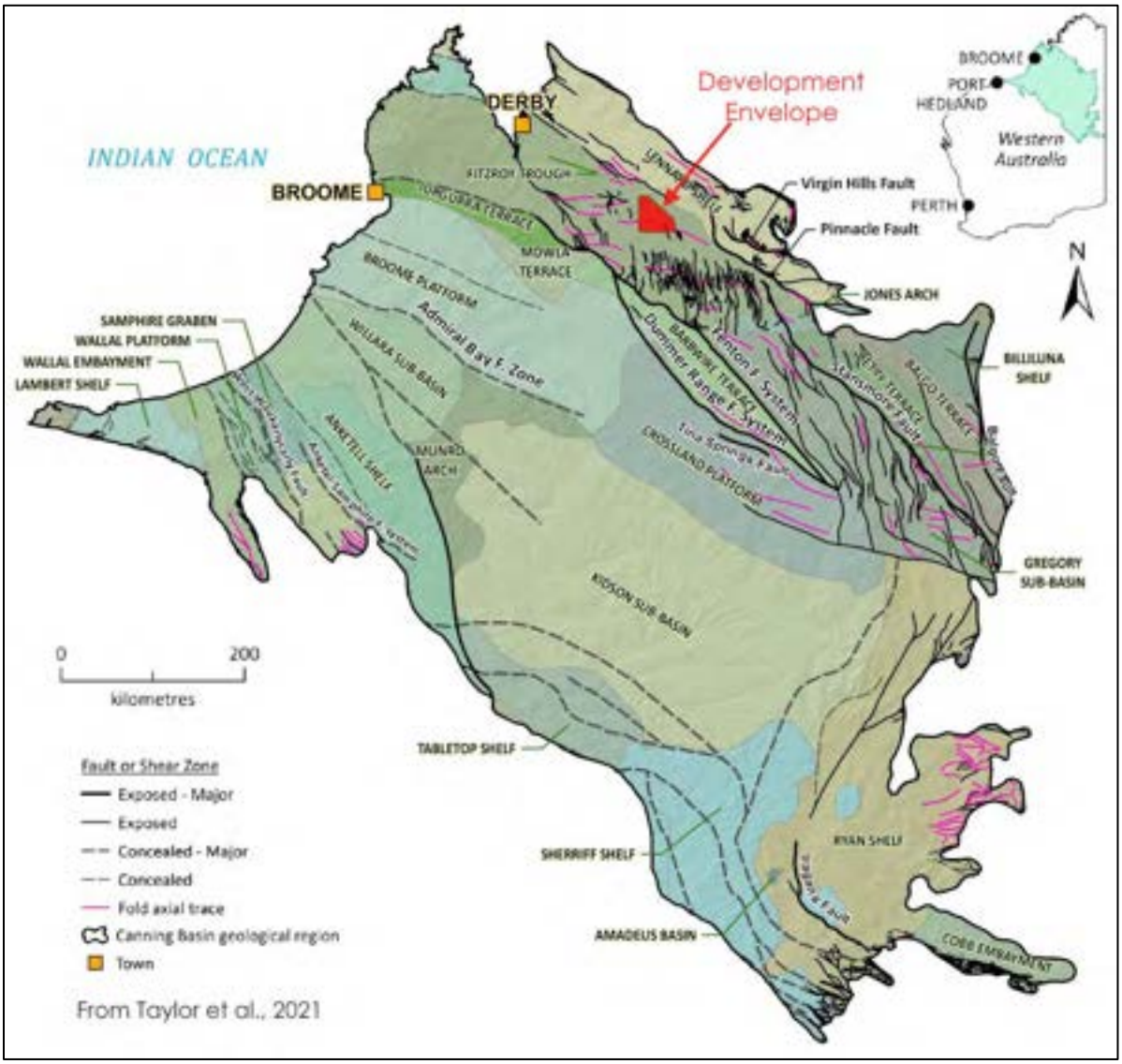


Figure 2-1. Tectonic and structural elements of the Canning Basin

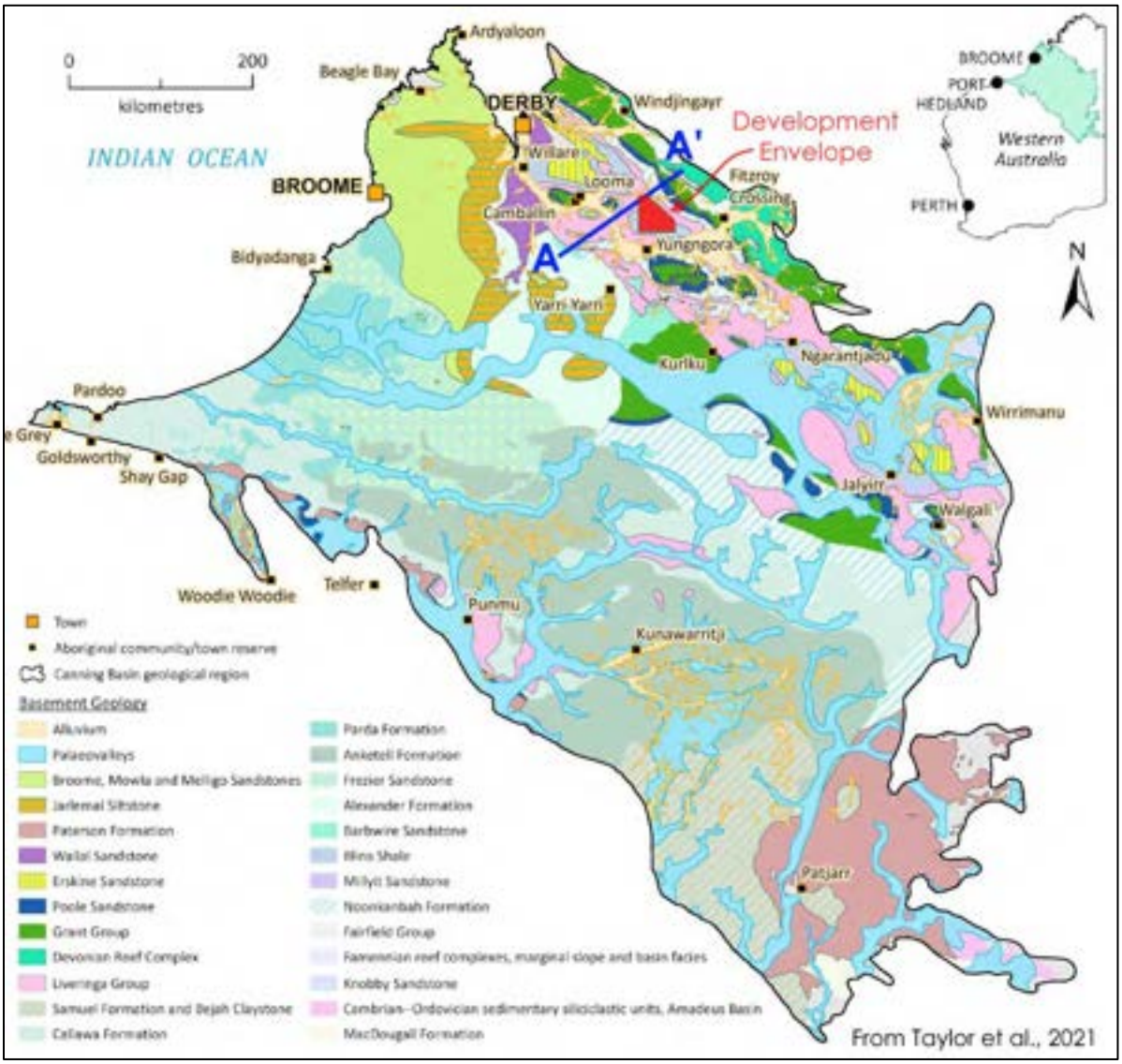


Figure 2-2. Surficial geology within the Canning Basin. The general location of the face of the block diagram in Figure 2-3 is represented by section line A-A'

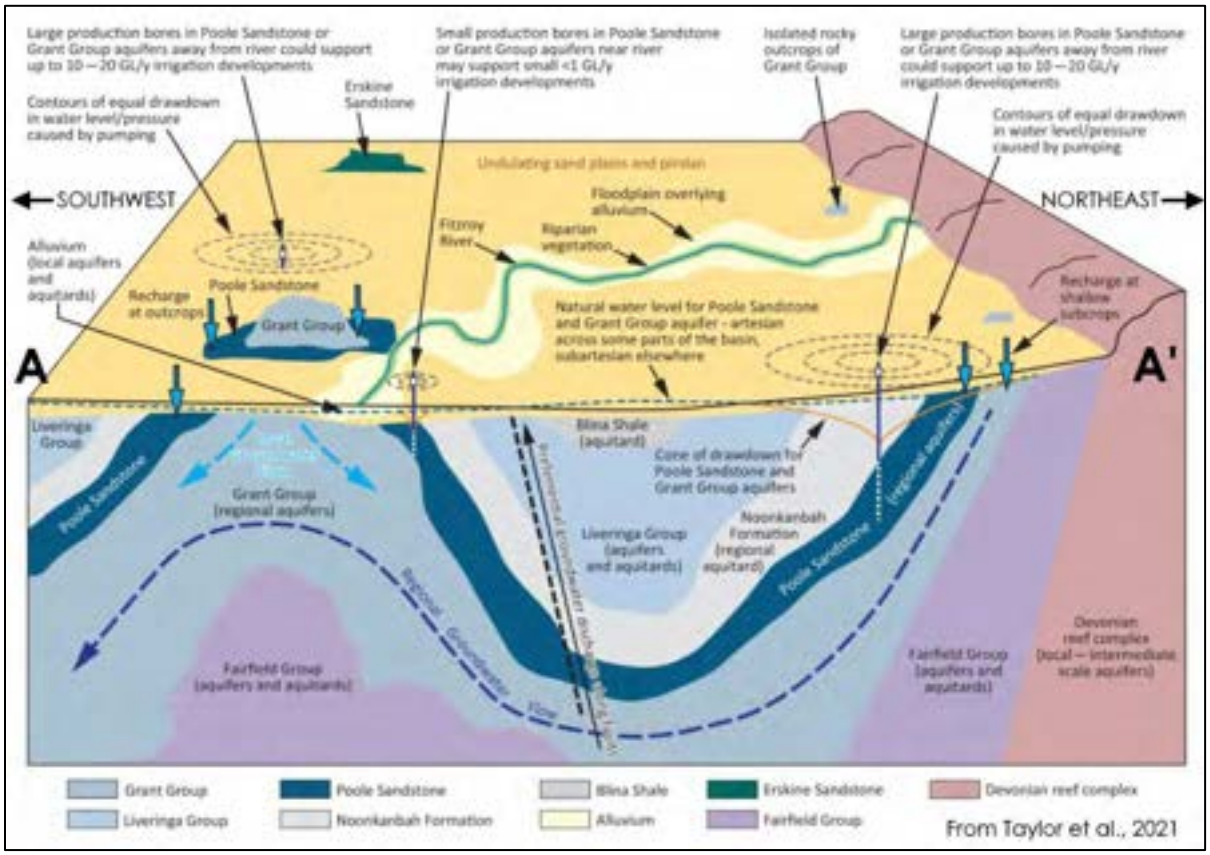


Figure 2-3. Simplified conceptual hydrogeologic block model showing the key aquifers within the Fitzroy Trough. The general location of the section that corresponds to the face of the block diagram is show as the blue line (A-A') on Figure 2-2.

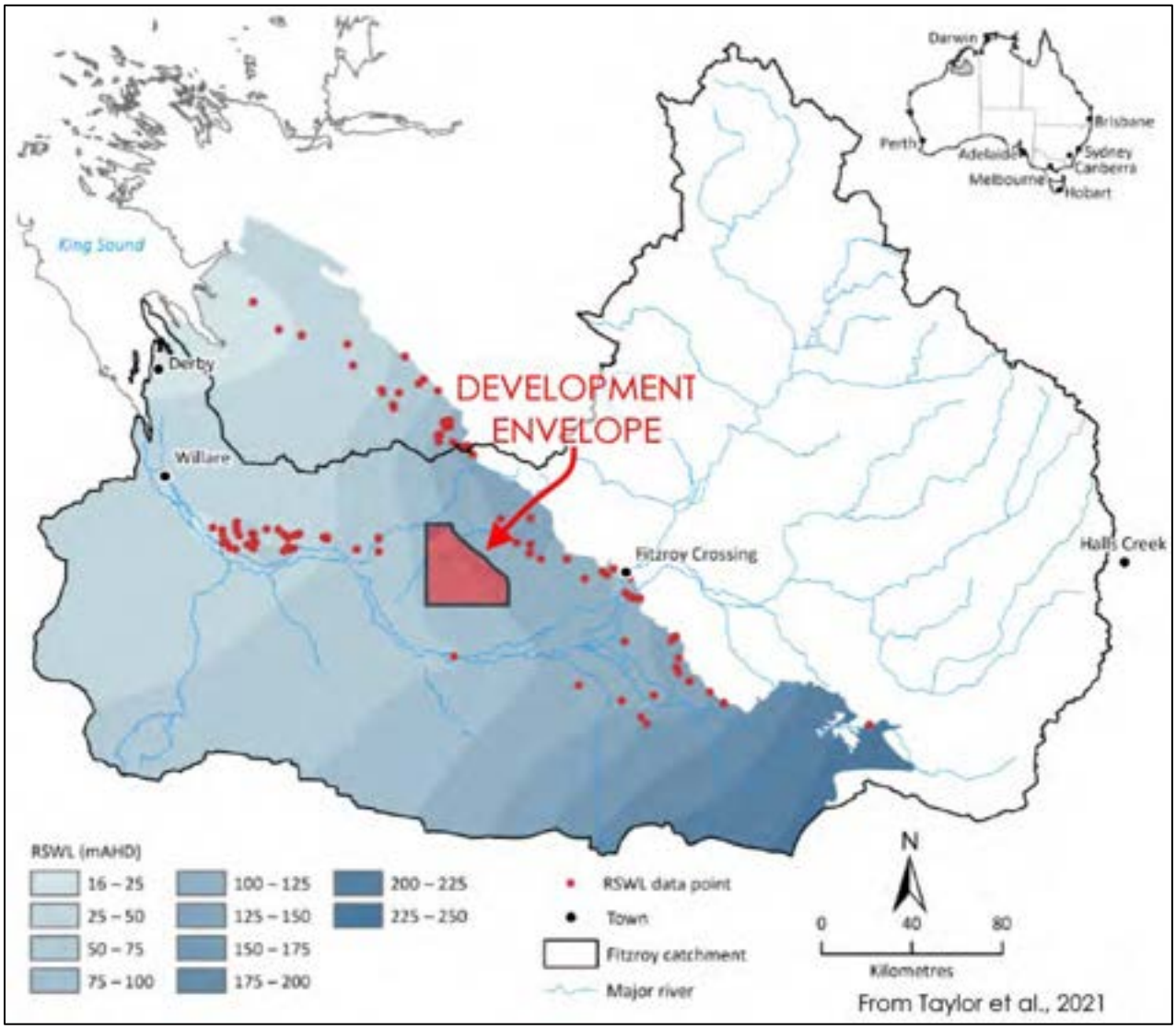


Figure 2-4. Potentiometric surface for the Grant Group and Poole Sandstone aquifers.

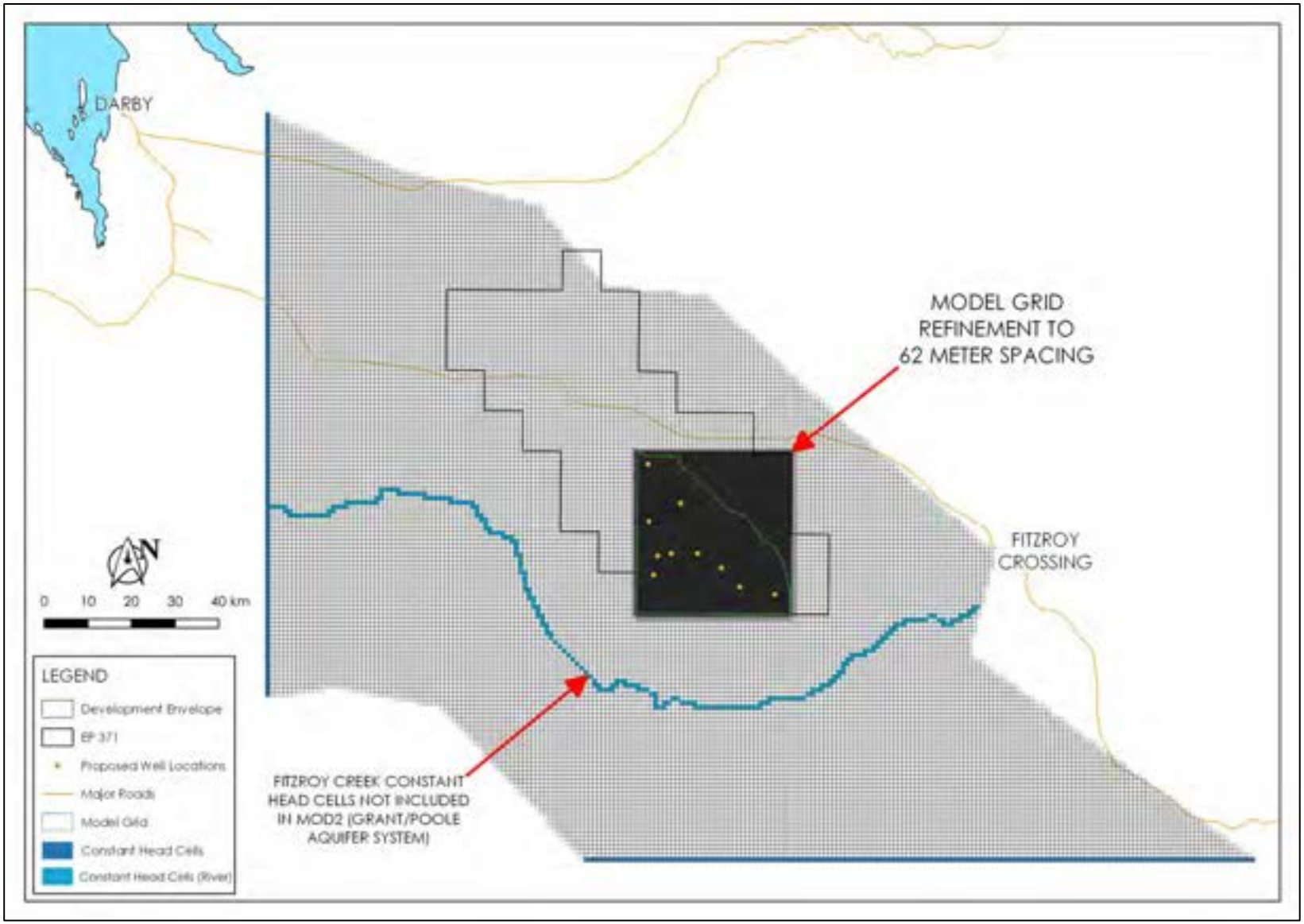


Figure 3-1. Map of MODFLOW 6 unstructured model grid with grid refinement within the development envelope.

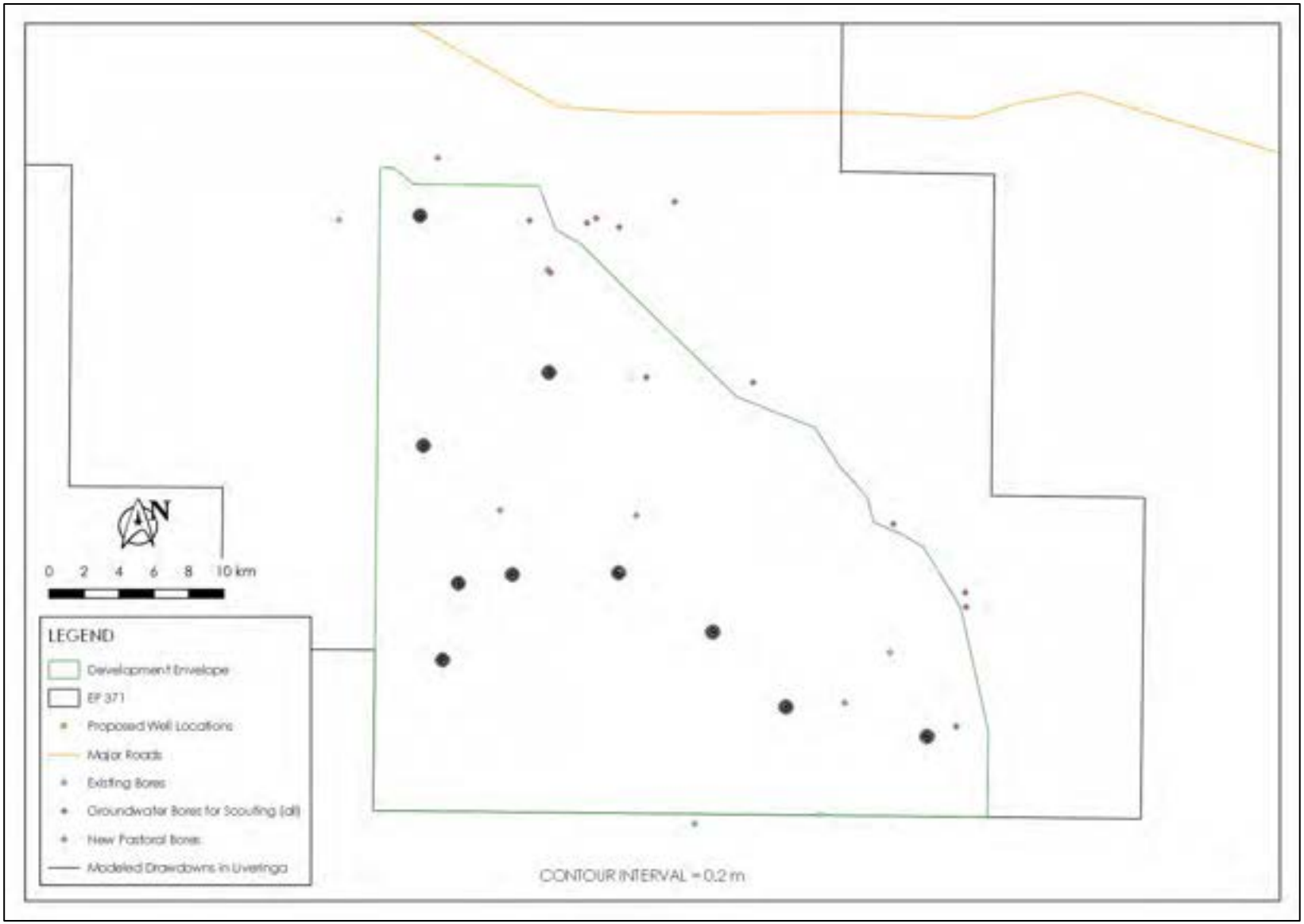


Figure 5-1. Mod 1 model results presented as drawdown contours after 6 months of pumping with contour interval = 0.2 meter.

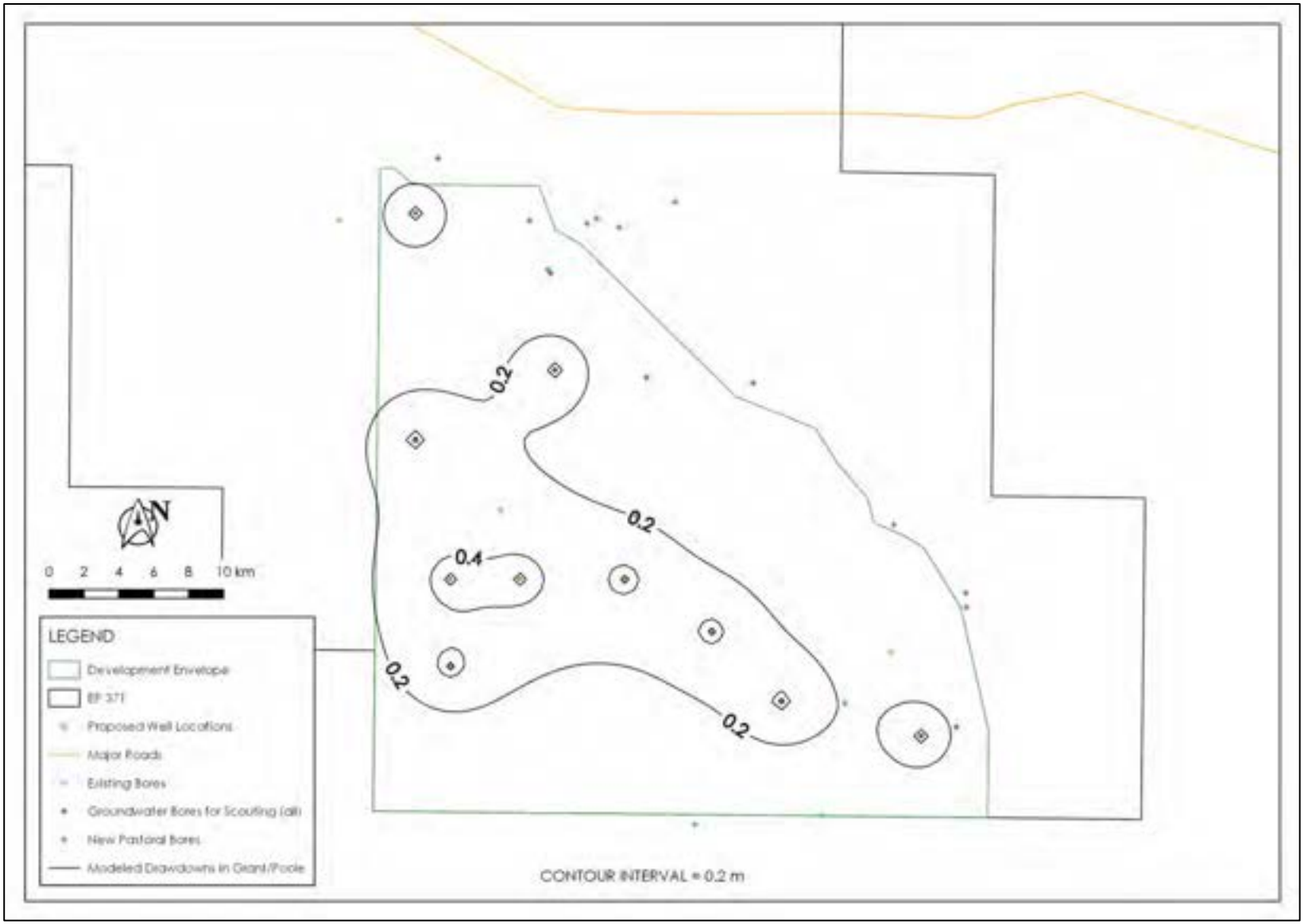
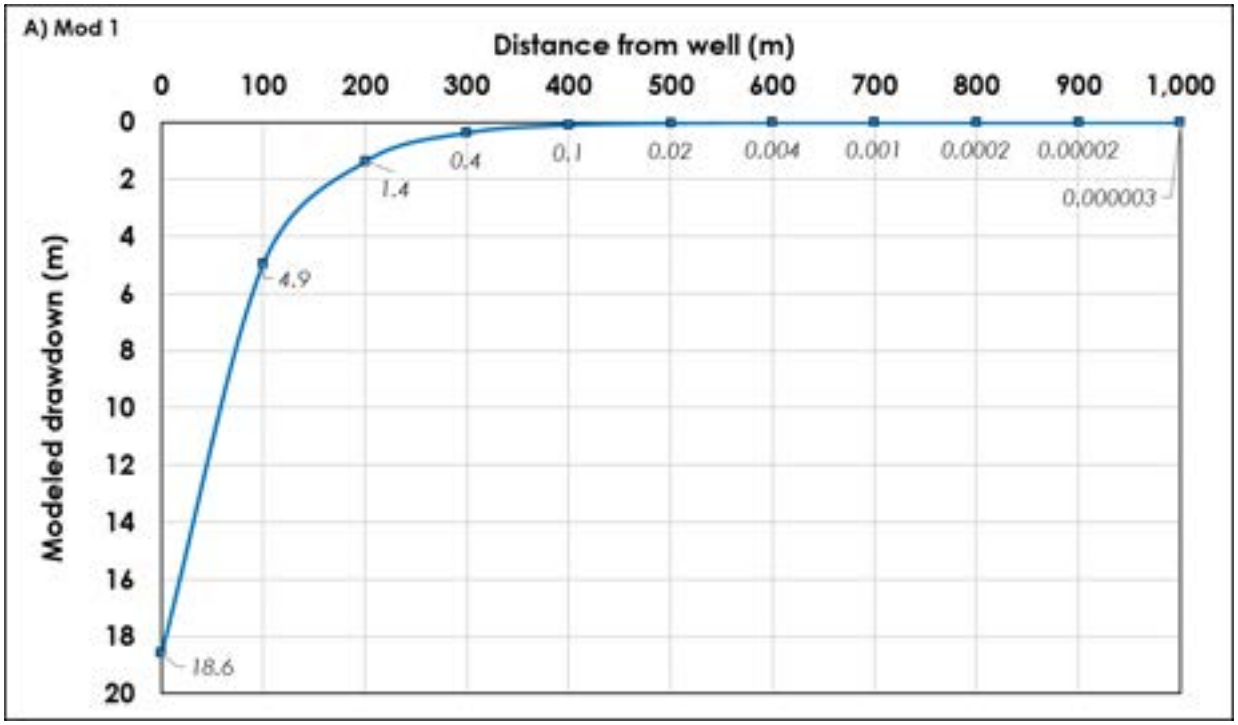


Figure 5-2. Mod 2 model results presented as drawdown contours after 6 months of pumping with contour interval = 0.2 meter.



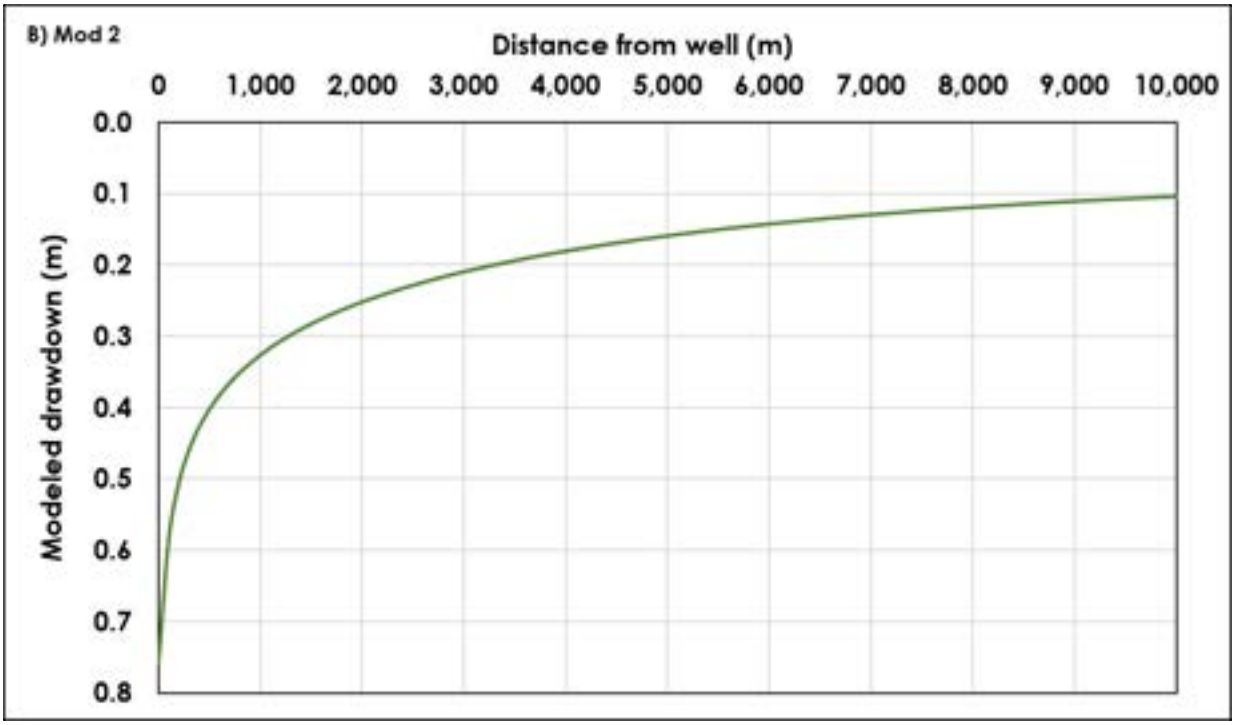


Figure 5-3. Model results presented as distance-drawdown plots after 6 months of pumping for the A) Mod 1 and B) Mod 2 simulations with pumping only applied to a single well. The *italic* numbers on A) are the modelled drawdowns at 100-m intervals from the pumping well.

Tables

Table 6-1. Summary of model sensitivity analysis for Mod 1. Values in column 5 are modelled drawdowns at the pumping bores. Sim00 is the model described in Section 4 & 5.

Sim No.	Q kL/d	K m/d	Sy	Avg at Pumping Bores m	Notes
Sim01		0.00001	0.01	**25.2**	
Sim02			0.1	**16.2**	**Pumping rate is**
Sim03			0.3	**9.2**	**sustainable for all**
Sim04	**91.758**	0.001	0.01	**22.8**	**modeled conditions**
Sim05	**50%**		0.1	**15.2**	
Sim06			0.3	**8.8**	**Modeled drawdowns are**
Sim07		0.1	0.01	**2.3**	**<0.01 m at existing bores**
Sim08			0.1	**2.1**	
Sim09			0.3	**1.9**	
Sim10		0.00001	0.01	**55.3**	
Sim11			0.1	**33.5**	**Pumping rate is**
Sim12			0.3	**18.5**	**sustainable for all**
Sim13	**183.516**	0.001	0.01	**49.5**	**modeled conditions**
Sim14	**100%**		0.1	**31.3**	
Sim15			0.3	**17.8**	
Sim00		**0.05**	**0.05**	**7.7**	**Modeled drawdowns are**
Sim16		0.1	0.01	**4.6**	**<0.01 m at existing bores**
Sim17			0.1	**4.3**	
Sim18			0.3	**3.8**	
Sim19		0.00001	0.01	**95.2**	**Pumping rate is**
Sim20			0.1	**52.2**	**sustainable for all**
Sim21			0.3	**28.1**	**conditions, but could**
Sim22	**275.274**	0.001	0.01	**84.0**	**be marginal for the**
Sim23	**150%**		0.1	**48.8**	**lowest Sy values**
Sim24			0.3	**27.1**	
Sim25		0.1	0.01	**7.0**	**Modeled drawdowns are**
Sim26			0.1	**6.4**	**<0.01 m at existing bores**
Sim27			0.3	**5.7**	
Sim28		0.00001	0.01	***169.6***	*Pumping rate is not sustainable*
Sim29			0.1	***121.4***	*Significant loss of sat. thickness*
Sim30			0.3	**58.1**	
Sim31	**550.548**	0.001	0.01	***170.0***	*Pumping rate is not sustainable*
Sim32	**300%**		0.1	***114.7***	*Significant loss of sat. thickness*
Sim33			0.3	**56.0**	**Pumping rate is sustainable**
Sim34		0.1	0.01	**14.2**	**for all other conditions.**
Sim35			0.1	**13.1**	**Modeled drawdowns are**
Sim36			0.3	**11.4**	**<0.01 m at existing bores**

Table 6-2. Summary of model sensitivity analysis for Mod 2. Values in columns 5-8 are modelled drawdowns at the pumping bores and existing bores. Sim00 is the model described in Section 4 & 5.

Sim No.	Q kL/d	T m^2/d	S	Avg at Pumping Bores m	Min at Existing Bores m	Avg at Existing Bores m	Max at Existing Bores m	Notes
Sim01		10	0.0001	**9.9**	**0.1**	**0.7**	**2.2**	**Pumping rate is**
Sim02			0.001	**7.4**	**0.0**	**0.0**	**0.3**	**sustainable for all**
Sim03			0.01	**5.7**	**0.0**	**0.0**	**0.0**	**modeled conditions**
Sim04	**91.758**	100	0.0001	**1.7**	**0.3**	**0.5**	**1.1**	
Sim05	**50%**		0.001	**0.9**	**0.0**	**0.0**	**0.1**	**Drawdowns greater than**
Sim06			0.01	**0.7**	**0.0**	**0.0**	**0.0**	**one meter at existing**
Sim07		1000	0.0001	**0.2**	**0.0**	**0.0**	**0.1**	**bores for lowest**
Sim08			0.001	**0.1**	**0.0**	**0.0**	**0.0**	**storativity range**
Sim09			0.01	**0.1**	**0.0**	**0.0**	**0.0**	
Sim10		10	0.0001	**19.8**	**0.1**	**1.4**	**4.4**	
Sim11			0.001	**14.8**	**0.0**	**0.1**	**0.6**	**Pumping rate is**
Sim12			0.01	**11.5**	**0.0**	**0.0**	**0.0**	**sustainable for all**
Sim13	**183.516**	100	0.0001	**3.4**	**0.6**	**1.1**	**2.3**	**modeled conditions**
Sim14	**100%**		0.001	**2.0**	**0.0**	**0.1**	**0.4**	
Sim15			0.01	**1.5**	**0.0**	**0.0**	**0.1**	**Drawdowns greater than**
SIm00		**265**	**0.001**	**0.8**	**0.0**	**0.1**	**0.3**	**one meter at existing**
Sim16		1000	0.0001	**0.5**	**0.2**	**0.3**	**0.4**	**bores for lowest**
Sim17			0.001	**0.2**	**0.0**	**0.0**	**0.1**	**storativity range**
Sim18			0.01	**0.2**	**0.0**	**0.0**	**0.0**	
Sim19		10	0.0001	**29.8**	**0.2**	**2.1**	**6.7**	**Pumping rate is**
Sim20			0.001	**22.3**	**0.0**	**0.1**	**0.9**	**sustainable for all**
Sim21			0.01	**17.2**	**0.0**	**0.0**	**0.0**	**modeled conditions**
Sim22	**275.274**	100	0.0001	**5.2**	**0.9**	**1.7**	**3.4**	
Sim23	**150%**		0.001	**3.0**	**0.0**	**0.2**	**0.6**	**Drawdowns greater than**
Sim24			0.01	**2.2**	**0.0**	**0.0**	**0.1**	**one meter at existing**
Sim25		1000	0.0001	**0.9**	**0.4**	**0.5**	**0.7**	**bores for lowest**
Sim26			0.001	**0.5**	**0.1**	**0.1**	**0.3**	**storativity range**
Sim27			0.01	**0.3**	**0.0**	**0.0**	**0.1**	
Sim28		10	0.0001	**59.5**	**0.3**	**4.2**	**13.4**	**Pumping rate is**
Sim29			0.001	**44.5**	**0.0**	**0.2**	**1.9**	**sustainable for all**
Sim30			0.01	**34.4**	**0.0**	**0.0**	**0.0**	**modeled conditions**
Sim31	**550.548**	100	0.0001	**10.4**	**1.9**	**3.4**	**6.9**	
Sim32	**300%**		0.001	**5.9**	**0.0**	**0.4**	**1.3**	**Drawdowns greater than**
Sim33			0.01	**4.5**	**0.0**	**0.0**	**0.2**	**one meter at existing**
Sim34		1000	0.0001	**1.9**	**1.0**	**1.2**	**1.6**	**bores for lowest**
Sim35			0.001	**1.0**	**0.2**	**0.3**	**0.6**	**storativity range**
Sim36			0.01	**0.6**	**0.0**	**0.0**	**0.1**	

Appendix M. Groundwater Management Plan

Valhalla Gas Exploration and Appraisal Program

Groundwater Management Plan

BNR_HSE_MP_015

VERSION HISTORY				
Ver. No.	**Ver. Date**	**Author**	**Reviewer**	**Revision**
1	10 Jan 2022	TN, AF	SR	Draft
2	01 Jul 2023	MLL, AF	ML	Final
3	26 Apr 2024	MLL, AF	ML	Final

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Acronym / abbreviation / definition

Terms / acronym	Definition / expansion
AER	Annual Environmental Report
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
Baseline groundwater monitoring	Refers to the measurement of groundwater levels and collection of groundwater samples to determine water quality prior to the commencement of proposed activities
BNR	Bennett Resources Pty Ltd
DEMIRS	(WA) Department of Energy, Mines, Industry Regulation and Safety (from 1 Dec 2023)
DMIRS	Former (WA) Department of Mines, Industry Regulation and Safety, now DEMIRS
DMP	Former (WA) Department of Mines and Petroleum; now DEMIRS
DoW	Former (WA) Department of Water; now DWER
DWER	(WA) Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
e.g.	For example
EP 371	Exploration Permit 371
EP Act	(WA) Environmental Protection Act 1986
EPA	(WA) Environmental Protection Authority
ERD	Environmental Review Document
GDE	Groundwater Dependent Ecosystems
GWMP	Groundwater Management Plan
ha	Hectare
HFS	Hydraulic Fracture Stimulation
i.e.	That is
kL	Kilolitres
km	Kilometres
km^2	Square kilometres
m	Metres
ML	Megalitres
Proposal	Valhalla Gas Exploration and Appraisal Program
QA/QC	Quality Assurance / Quality Control
SD	Standard Deviation
Surveillance groundwater monitoring	Refers to monitoring that occurs after commencement of an activity and is not considered to be representative of ‘baseline ‘conditions. Any data collected after commencement of a petroleum activity should be directly compared to baseline data and relevant standards to determine whether changes have occurred
WA	Western Australia

Terms / acronym	Definition / expansion
~	Approximately

1 Executive summary

This Groundwater Management Plan (GWMP) has been prepared by Bennett Resources (BNR) to support the assessment, approval and implementation of the Valhalla Gas Exploration and Appraisal Program (the Proposal) under Part IV of the *Environmental Protection Act 1986* (EP Act).

Bennett Resources referred the Proposal to the Environmental Protection Authority (EPA) under Part IV of the EP Act on 24 December 2020 (EPA Assessment Number 2281). The EPA has decided to assess the Proposal as Public Environmental Review. The Environmental Review Document (ERD) is to include environmental impact assessment (EIA) and management information, including this environmental management plan (EMP), which will be subject to an eight-week public review period.

This GWMP has been written in accordance with the guideline "Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans" (EPA 2021). An executive summary of this GWMP is provided in Table 1-1.

Table 1-1: Executive summary of the GWMP

Proposal title	Valhalla Gas Exploration and Appraisal Program (EPA Assessment Number 2281)
Proponent name	Bennett Resources Pty Ltd
Ministerial Statement number	The Proposal is currently being assessed by the EPA (Assessment 2281) and a Ministerial Statement and associated proposal implementation conditions are yet to be issued.
Purpose of the GWMP	The purpose of this GWMP is to detail the monitoring requirements along with response actions for trigger and threshold criteria that are required for the Proposal.
EPA key environmental factor and objective, and GWMP outcomes	**Inland Waters – EPA objective:** *To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.* GWMP outcomes: • no long-term changes to groundwater levels • no short or long-term changes to groundwater quality.
Condition clauses	No Ministerial Statement at the time of preparing the GWMP.
Key components in the GWMP	The key components of this GWMP are: • baseline groundwater monitoring: which refers to the measurement of groundwater levels and collection of groundwater samples to determine water quality prior to the commencement of proposed activities. • surveillance groundwater monitoring: which refers to monitoring that occurs after commencement of an activity and is not considered to be representative of 'baseline 'conditions. Any data collected after commencement of a petroleum activity should be directly compared to baseline data and relevant standards to determine whether changes have occurred. • trigger and threshold criteria and subsequent response actions • annual reporting (including results of monitoring).
Proposed construction / commencement date	TBC – within Calendar Year 2024.
EMP required pre-construction / commencement?	Yes ☒ No ☐

2 Context, scope and rational

2.1 Proposal

The Proposal is to complete an unconventional exploration and appraisal drilling and Hydraulic Fracture Stimulation (HFS) program within Petroleum Exploration Permit EP 371 (EP 371) in the Canning Basin, within the Shire of Derby / West Kimberley in Western Australia (WA). The intent of the Proposal is to evaluate the large tight gas resource in the region which has the potential to offer long-term energy security to Australia. The onshore Canning Basin is an early Ordovician to early Cretaceous aged geological basin that covers approximately 430,000 km^2 in the West Kimberley region. The Proposal is targeting hydrocarbons present from the Laurel through to the Devonian Formations, ranging from 2,000 m to 5,000 m below ground level. The main target is the Laurel Formation, with hydrocarbons present at depths between 2,000 m and 4,000 m below ground level. Table 2-1 provides a summary of the proposal.

Table 2-1: Summary of the Proposal

Proposal title	Valhalla Gas Exploration and Appraisal Program (EPA Assessment Number 2281)
Proponent name	Bennett Resources Pty Ltd (BNR)
Short description	The Proposal is to undertake an unconventional exploration and appraisal drilling program within EP 371, located in the Canning Basin, West Kimberley of Western Australia. The Proposal involves constructing up to 20 exploration wells within 10 well sites. The intent of the Proposal is to further explore and appraise the extent of the tight gas reservoirs present from the Laurel through to the Devonian Formations, at depths ranging from 2,000 m to 5,000 m below ground level. The exploration and appraisal program are expected to commence in 2024.

2.2 Key environmental factors

Two key elements have been identified as having the potential to affect the Key Environmental Factor – Inland Waters. These are:

- water abstraction for process water and camp supply
- gas exploration method (unconventional).

A summary of the Inland Waters environmental factor with a specific focus on these elements and subsequent impacts relating to this activity is included below in Table 2-2.

Table 2-2: Summary of key environmental factor – Inland Waters

EPA objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Policy and guidance	• Environmental Key Factor Guideline – Inland Waters (EPA 2018) • Australian and New Zealand Environment and Conservation Council (ANZECC) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2018) • Department of Water – Water Quality Protection Notice 26 (liners for containing pollutants, using synthetic membranes) (DoW 2013) • Department of Mines and Petroleum (DMP) / Department of Water (DoW). Guideline for groundwater monitoring in the onshore petroleum and geothermal industry (DMP & DoW 2016).
Project activities	• water abstraction for process water and camp supply • gas exploration method (unconventional).
Environmental values / receptors	• Liveringa and Grant Group (including Poole Sandstone and Reeves) Aquifers • the Groundwater Dependent Ecosystem (GDE) Mount Hardman (associated with the Liveringa Aquifer) • other groundwater users (>18 km away from the Development Envelope).
Potential impacts – direct impacts	• changes to groundwater levels (groundwater drawdown) associated with water extraction • contamination of surficial aquifers due to lost circulation.

Potential impacts – indirect impacts	• contamination of aquifers through unplanned fracture heights • contamination of surficial aquifers from an accidental release at the surface of drilling fluids, HFS chemicals, liquid hydrocarbons or produced formation water.

2.3 Condition requirements

The Proposal is currently being assessed by the EPA (Assessment 2281) and a Ministerial Statement and associated proposal implementation conditions are yet to be issued. Should this Proposal be approved for implementation, any conditions relating to this GWMP will be included in this section.

2.4 Rationale and approach

This section provides a concise description of the rationale and approach for this Plan. Specifically, the following sub-sections summarise:

- the site-specific environmental values, existing and/or potential uses, ecosystem health condition or sensitive component of the key environmental factor which will be affected (Section 2.4.1)
- study findings (Section 2.4.3)
- key assumptions and uncertainties (Section 2.4.4)
- management approach (Section 2.4.5)
- rational for choice of indicators (Section 2.4.6).

2.4.1 Receiving environment

The Development Envelope is situated in the Canning Basin region within the Fitzroy River catchment. The Canning Basin is considered the second largest groundwater resource in Australia after the Great Artesian Basin. It is a large sedimentary basin covering an onshore area of more than 450,000 km^2 (DoW 2012). The major regional aquifer systems in the Canning Basin are (in order of decreasing age):

- Grant Formation
- Liveringa Formation
- Wallal Sandstone
- Broome Sandstone.

Data from three petroleum wells drilled within the Development Envelope by the previous operator of EP 371 provides a detailed two-dimensional cross section of the aquifers located within the Development Envelope. Specifically, the major aquifers that are present within the Development Envelope include the:

- Liveringa aquifer
- Grant Group (including the Reeves aquifer) and Poole Sandstone aquifers.

A detailed summary of these aquifers with reference to local data has been provided in the Environmental Review Document for the Proposal (BNR_HSE_MP_013) and has not been duplicated here. However, a summary of the values of these aquifers is provided in Table 2-3 and Table 2-4.

Water quality of the Liveringa aquifer within the Development Envelope is well understood given the sampling programs that have been conducted for previous petroleum activities within EP 371.

Data provided from the Yungngora Community (over the past 4 years) and Fitzroy Crossing public drinking water source area reserve have been used to inform the water quality of the Poole Sandstone aquifer. These were selected as they are the closest groundwater users that extract water for potable drinking purposes. The Poole Sandstone aquifer is hydrogeologically similar to and considered to be part of the Grant Group (which also includes the Reeves aquifer).

Information regarding the aquifer quality of the Liveringa and Grant Group/Poole Sandstone aquifers is provided in the ERD and has not been duplicated here.

Table 2-3: Summary of Liveringa Aquifer values

Aquifer	Liveringa
Recharge mechanism	Rainfall on outcrop areas
Connectivity with other aquifers	Limited – underlain by the Noonkanbah (shale) Formation that is considered an aquitard, and is ~357 m thick
Number of baseline samples and duration of program	At least 21 samples (per bore) over 5 years
Number of groundwater licences within the Development Envelope	4
Regional use	• unlicensed livestock bores • main roads • oil and gas.

Table 2-4: Summary of Grant Group Aquifer values

Aquifer	Grant Group (including Reeves) and Poole Sandstone
Recharge mechanism	Rainfall on outcrop and shallow outcrops (none present within the Development Envelope)
Connectivity with other aquifers	Limited – underlain by the Anderson (shale) Formation that is considered an aquitard and is ~184–279 m thick
Number of baseline samples and duration of program	At least 5 samples (per bore) over 3 years
Number of groundwater licences within the Development Envelope	One, however, there are no known extraction bores.
Regional use	• oil and gas operators • mining operators • main roads • unlicensed for uses such as livestock and domestic bores • potential tourist operations • Indigenous community bores.

2.4.2 Environmental outcomes

The overall purpose of this GWMP is to quantify the potential environmental impacts and risks associated with the Proposal activities on inland waters. In meeting this objective, BNR will be able to verify the outcomes of the ERD which state that the impacts and risks are not significant given the manner in which the Proposal is planned to be implemented.

Based upon the groundwater monitoring program selected for the Proposal (Section 3.1), an outcome-based approach has been selected given the ability to collect quantitative data that enables unbiased scientific analysis to be completed. Further to this, the quantitative groundwater indicators for this GWMP have been based on baseline regional and local data, enabling outcomes to be selected for the Proposal.

Consequently, the following outcomes have been defined for this GWMP:

- No long-term changes to groundwater levels
- No short or long-term changes to water quality.

2.4.3 Study findings

To inform the impact assessment associated with groundwater drawdown to other groundwater users and the Mount Hardman Creek GDE, BNR utilised a study by Rockwater (2016) that considered groundwater drawdown associated with HFS water abstraction within the Development Envelope. To complete the drawdown modelling,

Rockwater utilised Modflow Pro version 8.0.45, which incorporates MODFLOW, a groundwater modelling software designed by the US Geological Survey (McDonald and Harbaugh 1988). The model was set up with a rectangular grid of 57 rows, 57 columns and two layers covering an area of 5 km by 5 km centred on a single production bore. Layer 1 extends to 50 m depth, and Layer 2 to 170 m depth. Model cell sizes range from 25 m by 25 m near the production bore, to 100 m by 100 m in peripheral areas.

The model was set up initially with parameters that are typical of a minor aquifer such as the Liveringa but was calibrated with drawdown data observed during field monitoring. The model was run to predict groundwater level drawdowns arising from pumping a bore over a six-month period at the average rate required to produce 33,400 kL. The calculated drawdowns after six months of extraction are shown for each model layer in Figure 2-1. Modelling predicted that drawdowns of 1 m or more could extend up to 410 m from a production bore at the (deep) level of the screens in the production bore, but that there would be smaller drawdowns in the top 50 m of the Liveringa formation: 1.2 m close to the bore decreasing to 1 m at a distance of about 56 m from the bore, and 0.1 m at 690 m distance. Although the modelling is based on assumed parameters and the results are not unique, the calculated drawdowns are consistent with monitoring on the bores at the Valhalla North 1 and Asgard 1 well sites, where drawdowns at shallow depths (albeit with lower pumping rates) have been very small, and difficult to distinguish from normal seasonal fluctuations of about 0.2 to 1 m (depending on the frequency and magnitude of recharge events). For an overview of groundwater depth over the course of historic groundwater monitoring, refer to Appendix H of the Environmental Review Document (BNR_HSE_MP_013).

Using an extraction volume of 100,000 kL (100 ML) (which is the conservative maximum extraction for a Phase II well for the Proposal), the model predicted that a short-term drawdown of 1 m or more could extend up to 780 m from the extraction water bore at the (deep) level of the screens in the extraction bore (Rockwater 2016)). The model predicted that even with pumping for the maximum volume of 100 ML, groundwater levels would be expected to recover rapidly to within 0.2 m of baseline levels within hours of stopping extraction and to fully recover within weeks.

This model was not considered to be sophisticated enough and the potential for a drawdown of up to one metre raised concern through discussions with DWER. Therefore, additional modelling work was commissioned from Intera Geosciences Pty Ltd. MODFLOW 2005 was used to complete a detailed quantitative model to better understand groundwater drawdown. The Groundwater Vistas (ESI) modelling software was used to develop the input files, run the model executables and process model output. Two primary models were developed, one simulating the unconfined Liveringa Group (Mod 1) and one simulating the Grant/Poole aquifer system (Mod 2). A full explanation of the modelling approach is contained in annex to this management plan.

Model results are presented as mapped drawdown contours with a minimum contour of 0.2 metres and a 0.2 metre contour interval, which was chosen as normal seasonal fluctuations can range between 0.2 metres and one metre, so any values less than 0.2 metres are likely not significant relative to natural variations.

The modelled drawdown at the end of the six-month pumping period for Mod 1 showed the radius of the 0.2 metre drawdown contour was within 400 metres of each pumping bore, so would have no impact on any existing bores or groundwater systems.

The results from Mod 2 were similar, with predicted drawdowns of up to 0.4 metres, which is expected to be difficult to distinguish from normal seasonal variations in water levels of 0.2 – 1 metre (Rockwater, 2016).

Note, this means that the short-term drawdown will have less effect on the environment than seasonal fluctuations, given a maximum drawdown of between 0.2 and 0.4 metres and a recovery to 0.1 metre within one year of the cessation of pumping.

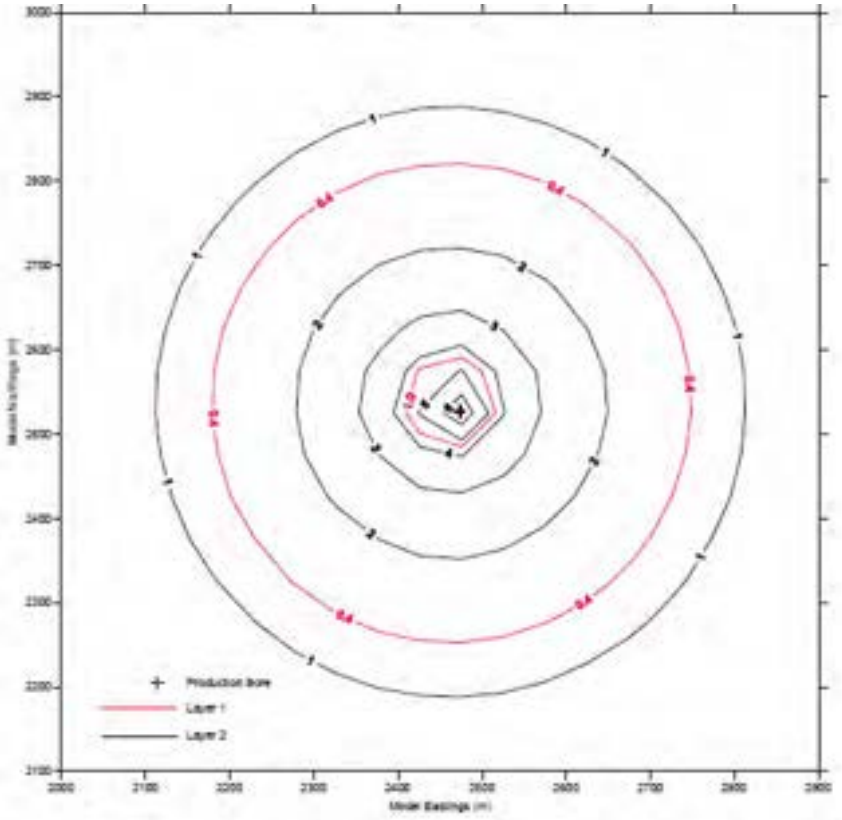

Figure 2-1 Drawdown contours associated with the extraction of 33,306 kL (Rockwater model)

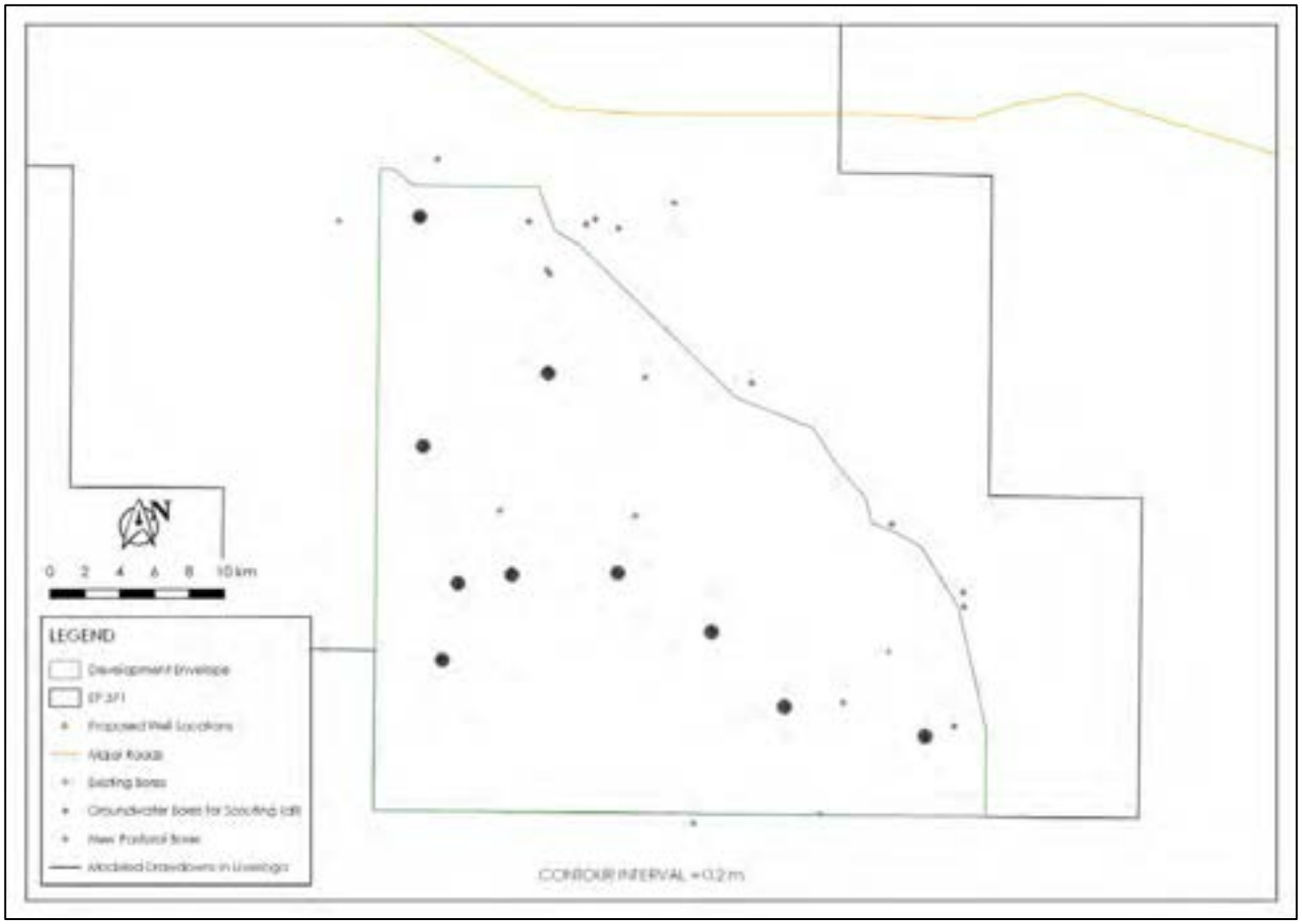

Figure 2-2: Mod 1 model results presented as drawdown contours after six months of pumping, with contour interval = 0.2 metres (Intera model)

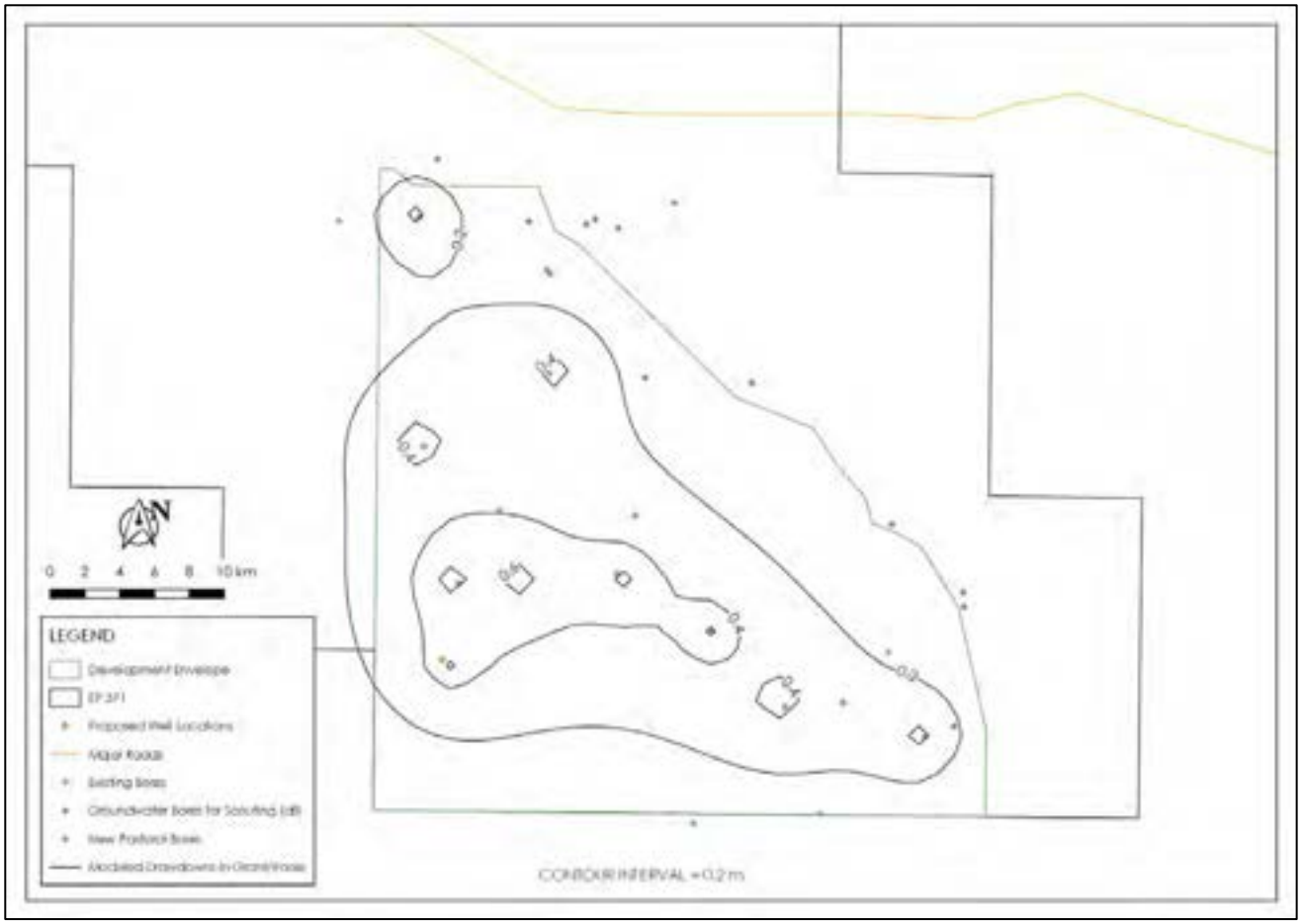

Figure: Mod 2 model results presented as drawdown contours after six months of pumping with contour interval = 0.2 metres (Intera model)

The results from Mod 1 indicate that abstraction of the required water volumes will not result in any noticeable impact to existing bores, and that the nearest GDE (Mount Hardman Creek or the Fitzroy River) are too far to experience any significant impacts.

The results from Mod 2 indicate that abstraction of the required water volumes from the Grant/Poole aquifer system would potentially induce temporary drawdowns of between 0.2 and 0.4 metres, and that these would likely recover within a year after the end of the pumping period. The impacts represent a very small percentage of the available water column in each well and would likely not induce any economic impact on existing wells.

Note, this model was considered conservative, as it assumed all rig supply bores to pump concurrently, which was unlikely to happen. In addition, recharge was not included in any of the model simulation.

2.4.4 Key assumptions and uncertainties

In accordance with EPA (2021), key assumptions or parameters that are used to support any numerical modelling are to be described in the GWMP. Specifically, key assumptions and uncertainties used in numerical groundwater modelling to understand the potential for water level drawdown associated with the Proposal are detailed in Table 2-5.

Table 2-5 Key assumptions and uncertainties

Number	Assumptions and Uncertainties	Comment
1	Number and location of extraction bores	BNR plans to install two extraction bores at each well site. Although modelling is based upon a single bore, abstraction bores are anticipated to either alternate or draw with reduced rates such that modelling from a single bore provides a conservative worst-case scenario.
2	Volume of water required to be extracted for the Proposal	The conservation maximum volume of water per well site is estimated to be 100 ML. Modelling volume was less (33 ML) but on review of a much larger number provided in Rockwater (2016) (100 ML), the modelling outcomes are expected to be sufficient to inform the EIA.

2.4.5 Management approach

BNR plans to implement outcome-based indicators under this GWMP. This approach has been determined to be the most appropriate as the outcome can be readily measured with clear thresholds set to enable a level of protection to be achieved.

2.4.6 Rationale for choice of indicators and/or response actions

The indicators proposed are based on the following rationale:

- groundwater modelling indicates that the Liveringa aquifer is in a state of dynamic equilibrium
- groundwater modelling indicates that a drawdown of groundwater is not expected to result in a significant impact to sensitive receptors or other users within proximity of the Proposal
- establishment of outcome-based indicators is achievable, and monitoring of groundwater parameters provide a direct insight into any potential environmental impact arising from the Proposal
- the adaptive management framework enables for clear decisions regarding water extraction to be made where any impacts may be observed. Where additional mitigation is implemented, the timeframe for mitigation to take effect is expected to be relatively short given the dynamic nature and throughflow of groundwater in the region.

A summary of the specific indicators and their justification is provided below.

Groundwater Quality

The DMP and DoW guideline (2016), details a comprehensive list of analytes that is standard for onshore oil and gas projects in WA. Specifically, the guideline recommends that the following criteria be sampled:

- in-field parameters, including water level and dissolved oxygen
- physico-chemical parameters
- ions, including chloride and sulfate
- total metals, including arsenic and chromium
- dissolved gases
- benzene, toluene, ethylbenzene, xylene, naphthalene
- other hydrocarbons.

As the Scientific Inquiry states: An enforceable Code of Practice should include the requirement to test for, and assess the risk from, a comprehensive list of analytes in groundwater, produced and flowback water, including geogenic chemicals and radon, BNR has taken to include the following analytes to be included in the sampling plan:

- radon
- uranium

- geogenic chemicals.

To understand the specific Indicators or Constituents of Potential Concern (CoPC), BNR reviewed the potential environmental impacts and risks as detailed in the Valhalla Gas Exploration and Appraisal Program, Section 38 Assessment – Environmental Review Document (BNR_HSE_MP_013). The Proposal indicates the following fluids as having the potential to impact water quality:

- surface release of drilling fluids and HFS fluids
- subsurface release of drilling fluids
- subsurface release of HFS fluids.

On this basis, the following analytes have been identified for the Proposal to be used as indicators of spill events:

- barium
- cadmium
- chloride
- chromium III
- sulfate
- Total Petroleum Hydrocarbons (TPH)

BNR reviewed the Assessment and Management of Contaminated Sites: Contaminated Sites Guidelines (DER 2014), to identify various health screening levels (Table 2-6). However, given the absence of health screening levels for most constituents, BNR has opted to utilize a before and after impact analysis for the data of these indicators. This ensures that should local geology impact water quality, the collection of baseline samples will enable historic averages to be collected and simple average / standard deviation analysis be utilized to understand water quality variance.

Table 2-6: Groundwater Health Screening Levels

Analyte	Indicators
barium	-
cadmium	-
chloride	-
chromium III	-
sulfate	500 mg/kg (DER 2014)
TPH (C10-C14)	-
TPH (C15-C18)	-
TPH (C6-C9)	-

Groundwater Levels

As detailed in Section 2.4.3, groundwater levels fluctuate naturally between 0.2 to 1 m (depending on the frequency and magnitude of recharge events). For an overview of groundwater depth over the course of historic groundwater monitoring, refer to Appendix H of the Environmental Review Document (BNR_HSE_MP_013).

Consequently, BNR has adopted a trigger / threshold indicator of 1 m for groundwater level as historical data indicates natural variation of up to 1 m is present within the Development Envelope.

3 GWMP components

This section of the GWMP identifies the legal provisions (components) in Table 3-1 that BNR will implement to ensure that the environmental outcomes are met during the implementation of the Proposal.

In accordance with the guideline “Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans” (EPA 2021), this section identifies the indicators that will be used to measure performance and the monitoring that will be undertaken in relation to these indicators. It defines the response actions (trigger level and contingency actions) that will be undertaken if the indicators are exceeded. Table 3-1 details the components of this plan, including monitoring and reporting commitments. Further information regarding monitoring has been described in Section 3.1.

BNR will update Table 3-1 in consultation with both the Department of Water and Environmental Regulations and the Department for Energy, Mining, Industry Regulation and Safety prior to implementation of any drilling activity. This will include the review of trigger and threshold criteria following the completion of wellsite specific baseline sampling.

Table 3-1: GWMP components

EPA factor/s and objective/s	**Inland Waters** – To maintain environmental quality and to minimise the risk of environmental harm, so that environmental values are protected			
GWMP outcome/s	• no long-term changes to groundwater levels • no short or long-term changes to groundwater quality			
Key environmental values	• Liveringa, Reeves and Grant Aquifers • the Groundwater Dependent Ecosystem (GDE) Mount Hardman (associated with the Liveringa Aquifer) • other groundwater users (pastoral stations and fixed receptors >18 km away from the Development Envelope).			
Key impacts and risks	• changes to groundwater levels • contamination of groundwater from surface and subsurface spills			
Indicators	**Response actions**	**Monitoring**	**Frequency**	**Reporting (Section 0)**
GWMP outcome – No long-term changes to groundwater levels **Trigger criteria** Groundwater level measured at defined monitoring locations (Table 3-2) exceed historical average groundwater level values of 0.7 m.	**Trigger level actions** • determine whether the water quality changes observed in the impact sites are comparable to baseline sampling [Note 1] • identify the reason for the change in water quality or groundwater levels and determine direct correlation to the Proposal activities or natural variation and review management measures with an adaptive management response. This may include cessation of groundwater pumping until levels return to their historical average levels and an increase in data collection and monitoring • re-examine water quality or groundwater level monitoring results (QA / QC) to validate data • where the threshold exceedance was not caused by the Proposal, resume standard water quality or groundwater level monitoring frequency • where the water quality or groundwater level threshold exceedance was caused by the Proposal, take steps to remedy the impact (for example cessation of pumping) re-monitor and increase monitoring frequency to monthly. **Threshold contingency actions** Initiate implementation of contingency measures including: • ground truth the water quality monitoring results to validate findings of the assessment and/or determine/identify what may be causing the exceedance. Where cause is identified during ground truthing and can be rectified, undertake action immediately. For actions which require alternate resources, schedule works to be undertaken as soon as possible	Refer to section 3.1	Refer to section 3.1	Routine reporting – Annual Compliance Assessment Report to the DWER Compliance Brach Exceedance reporting to DWER Compliance Branch – exceedance of the threshold criteria and contingency actions that have been implemented – within 5 days.
Threshold criteria When the groundwater level, measured at defined monitoring locations (Table 3-2), exceed historical average groundwater levels of 0.7 m over two consecutive monitoring events which are attributable to the Proposal.				

GWMP outcome – No short or long-term changes to groundwater quality	**Trigger criteria** Changes to groundwater quality at defined monitoring locations (Table 3-2) attributable to the project where they meet the following conditions: • 2 out of 3 successive samples fall outside the mean ± 1 Sigma (SD) limit • 4 out of 5 successive samples fall outside the mean ± 1 Sigma (SD) limit • 8 consecutive points on the same side of the mean. **Threshold criteria** Changes to groundwater and surface water quality at defined monitoring locations (Table 3-2) attributable to the project where they meet the following condition: 1 sample falls outside the mean ± 2Sigma (SD) limit.	• where the water quality or groundwater level threshold exceedance was not caused by the Proposal, resume standard monitoring frequency • where the threshold exceedance can be attributed to the Proposal activities: o implement adaptive management response (modified abstraction) management guidance within Section 4. This may include: • for groundwater level - ceasing abstraction, and sourcing water from other sources or reducing abstraction volumes • for groundwater quality - ceasing the petroleum activity to enable source of release to be investigated and mitigated o once response actions have been completed, extend the monitoring program and increase to monthly until groundwater quality and level values recover o continue to implement actions to remediate the exceedance until approval to cease has been given by the relevant regulator.	Refer to section 3.1	Refer to section 3.1	Routine reporting – Annual Compliance Assessment Report to the DWER Compliance Brach Exceedance reporting to DWER Compliance Branch – exceedance of the threshold criteria and contingency actions that have been implemented – within 5 days.

Note 1: Historical (regional) data available for both the Liveringa and Grant aquifers indicates that groundwater chemistry influenced by the geology is stable with limited variability over the sampling lifetime. Consequently, BNR will compare the variation of regional data with six-months of local baseline data to validate the expectation that the groundwater chemistry at the wellsites is comparatively stable with limited variance. This will be completed using a control charting methodology utilising key constituents, which will be:

- barium
- cadmium
- chloride
- chromium III
- sulfate
- Total Petroleum Hydrocarbons (TPH)

Regional data will be utilised to determine long-term geochemistry variation (mean and utilising standard deviation analysis), this will then be applied to local baseline data. Where the variance is not statistically significantly different to variance displayed by regional constituents, the drilling activity (and surveillance sampling) may commence. Where variance is statistically significantly different to regional constituents an additional six months of local baseline sampling will be implemented (and the control chart methodology repeated following completion of the additional six-month sampling program). On completion of this variance analysis, a report will be sent to DWER and DEMIRS seeking endorsement for BNR to cease baseline sampling and commence the activity (and surveillance sampling).

3.1 Groundwater monitoring program

To clearly understand if the indicators (trigger and threshold criteria) have been met or exceeded, BNR has developed a groundwater monitoring program (Table 3-2) to be implemented over the life of the Proposal and following decommissioning/site reinstatement. This includes groundwater monitoring. Specifically, the monitoring program will be used to:

- establish if local site conditions are unique to those established by historic control sites (prior to well activities commencing) this will be achieved by constructing at least two monitoring bores at each well site, in addition to one monitoring bore into the Grant aquifer in the project area and collecting data prior to drilling of wells. These data will be analysed in conjunction with already held data from the Yungngora Community bore (YG2/18) and the four former Buru monitoring bores discussed in the ERD to establish updated baseline data
- establish duration and frequency of surveillance monitoring prior to well construction, for the duration of the Proposal and following decommissioning
- inform termination criteria for groundwater sampling.

Table 3-2: Groundwater monitoring program

Overview	BNR has developed this monitoring program to collect and analyse local groundwater quality at all well sites associated with the Proposal located within the Development Envelope.
Relevant guidelines	• Guidelines for groundwater quality protection in Australia: National Water Quality Management Strategy, Department of Agriculture and Water Resources (Australian Government 2013) • National Water Quality Management Strategy. Australian and New Zealand Environment and Conservation Council / Agricultural and Resource Management Council of Australia and New Zealand (ANZECC / ARMCANZ) (Australian Government 2018) • Health screening levels for petroleum hydrocarbons in soil and groundwater. Technical report No. 10. Australian Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (Friebel and Nadebaum 2011) • Guideline for groundwater monitoring in the onshore petroleum and geothermal industry (DMP & DoW 2016) • Environmental Factor Guideline – Inland Waters (EPA 2018) • National Environment Protection (Assessment of Site Contamination) Measure 1999. Schedule B1, as amended 16 May 2013 (National Environment Protection Council 2013) • National Water Quality Management Strategy Australian Drinking Water Guidelines (NHMRC and NRMMC 2011 (updated March 2021)) • Contaminated Sites Groundwater and Surface Water Chemical Screening Guideline. Western Australian Department of Health (DoH 2014) • *Water Quality Protection Note 30* (WQPN 30), Department of Water (Western Australian Government 2006, updated August 2023) • Minimum Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee 2011).
Purpose	To determine if the Proposal has had any adverse impacts to groundwater quality and groundwater levels during its implementation.
Monitoring approach	**Sampling location:** • each well site will have two monitoring bores installed[1] for each location similar to that provided in Figure 3-1 that is : o one at least 10 m down-gradient of the produced formation water evaporation pond

[1] Installation and drilling of all water bores (including abstraction bores) will be hydrostratigraphically logged in detail and geophysical interpretation of groundwater quality collected, for the interval where fresh aquifers are known to be present (including through the Grant formation). Annulus seals and gravel packs will be used, where necessary, to isolate the zone being monitored and prevent potential cross contamination via the bore casing as required by the Minimum Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee 2011) required to be followed as detailed in the Groundwater monitroing in the onshore petroleum and geothermal industry guideline (DMP & DoW 2016). BNR will conduct validation water samples (along with QA/QC samples of any fluids / water used for the bore installation process) at a point of discharge from the circulation system to understand if cross contamination may be occurring as evidenced by fluid constituent presence associated with bore installation. This may involve the use of tracer dyes, but these specifics are subject to local conditions, aquifer depths and will be direct by a hydrogeologist during bore installation.

	o one further downgradient of the petroleum well, with the final location determined once site specific information has been gathered. They may be located up to one kilometre down gradient • the location of the bores has been selected to coincide with different perceived risks (i.e., a surface release from the evaporation pond) or a migration of fluids through a fault to the Liveringa Aquifer • the location of the bores will be identified in consultation with DWER and DEMIRS • in addition, one bore will be installed into the Grant Aquifer • all of the bores will be constructed in accordance standards set in WQPN 30. **Sampling frequency – Baseline:** • samples will be collected monthly, at least six months prior to conducting the HFS activities at each individual well site. This frequency is considered suitable and is at a higher intensity than stated in the DMP and DoW guideline (2016) which states that quarterly sampling is considered adequate for monitoring where the general objective is to track any deviation from the baseline condition over time • samples will be compared to those undertaken at the baseline control sites (DMP & DoW 2016). **Sampling frequency – Surveillance:** • during proposal implementation, samples will be collected quarterly, for 12 months. Following this period, where no significant variation from baseline is identified, the sampling frequency will drop to twice a year, and continue following decommissioning/site reinstatement until the termination criteria is achieved • where changes are identified, the frequency of sampling may be increased, and additional groundwater sampling bores installed (as required) to gain a clear understanding of any potential impact • sampling will be increased during HFS activities and for six months following the completion of these activities. Where no significant variation from baseline is identified, sampling will then revert to quarterly. **Analysis:** • as per the DMP and DoW guideline (2016), a comprehensive list of analytes will be sampled including: o in-field parameters, including water level and dissolved oxygen o physico-chemical parameters o ions, including chloride and sulphate o total metals, including arsenic and chromium o dissolved gases o benzene, toluene, ethylbenzene, xylene, naphthalene o other hydrocarbons. o radon o uranium o geogenic chemicals • surveillance samples will be compared to both local baseline samples and baseline control sites to determine if there are changes to the groundwater that could be attributed to the Proposal.
Termination criteria	Surveillance monitoring at each individual well site will be terminated following data collection of at least four consecutive sampling events following decommissioning where: • chemical/hydrocarbon constituents are below relevant benchmarks or guideline values or have returned to within the expected natural dynamics of baseline state and/or control sites.

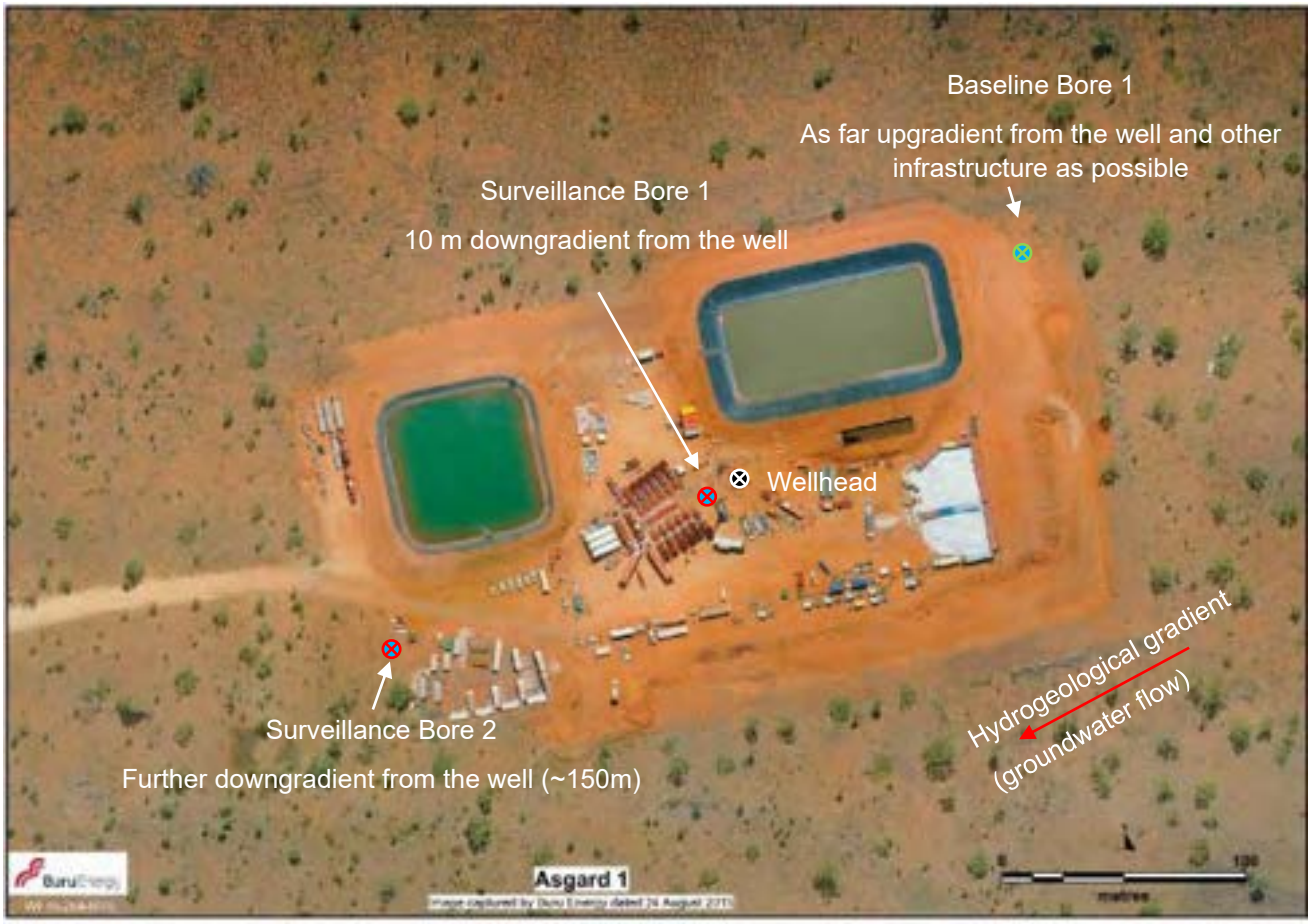

Figure 3-1: Indicative placement of baseline and surveillance bores having regard to wellsite layout

Note, figure 3-1 shows an indicative placement of monitoring bores and shows a wellsite layout with two rectangular ponds. Note that the likely site layout for this Proposal will include an L-shaped pond.

3.2 Reporting

The environmental outcomes will be routinely reported in the Part IV Compliance Assessment Report. This report will include:

- an overall statement of compliance with this GWMP
- analysis against the trigger and threshold criteria (Table 3-1) for each year
- declaration of compliance status against each of the requirements detailed in the Groundwater Monitoring Program
- a description regarding the effectiveness of any adaptive response actions that have been implemented.

In the event that threshold criteria are exceeded during the annual reporting period, exceedances will be reported to the DWER compliance branch within five days.

4 Adaptive management and review of the GWMP

4.1 Monitoring and adaptive management

A monitoring program (as defined in Section 3.1) is required to measure the effectiveness of the response actions as defined in this GWMP. The outcomes of the monitoring program will contribute to ongoing improvements in response actions to ensure an adaptive management approach is adopted.

BNR will implement an adaptive management framework that allows BNR to adapt and implement improvements as a result of monitoring against trigger and threshold criteria detailed in this document.

The following approaches will apply:

- monitoring data will be systematically evaluated
- the effectiveness and relevance of trigger level and threshold contingency actions will be evaluated to determine if any changes to response actions are required
- increased understanding of the hydrogeological regimes based on additional internal and external studies will be incorporated into the monitoring and management approach when newer relevant information becomes available where applicable.

Adaptive management practices that will be assessed as part of this approach may include:

- evaluation of the groundwater monitoring program, data and comparison to baseline data and reference sites on an annual basis to verify whether responses to project activities are the same or similar to predictions
- evaluation of assumptions and uncertainties of the management and monitoring program
- re-evaluation of the risk assessment and revision of risk-based priorities as a result of monitoring outcomes
- review of data and information gathered over the review period that has increased understanding of site environment in the context of the regional ecosystem
- assessment of changes which are outside the control of the project and the response actions identified.

4.2 Management plan review

This GWMP is intended to be dynamic and may be updated to reflect changes in management practices and the natural environment over time. Specifically, this GWMP will be reviewed and updated (as required):

- following completion of baseline monitoring and prior to commencing surveillance monitoring to ensure that the trigger and threshold criteria are updated in consultation with DWER
- annually
- and each time a new Environment Plan (under the *Petroleum and Geothermal Energy Resources Act 1967*) is approved.

This approach will allow flexibility to adopt new approaches / management measures. The effectiveness and relevance of trigger level and threshold contingency actions will be evaluated on an annual basis, and any amendments to response actions will be completed on an as-needed basis. This will include:

- amendment of response actions that are not achieving the desired outcomes
- monitoring that identifies additional impacts requiring additional response actions or changes to existing response actions
- changes to relevant legislation that may affect the implementation of response actions
- improvements to management practices to achieve a greater environmental outcome

- updates to trigger and threshold criteria following the completion of baseline sample collection prior to commencing any groundwater extraction.

Specifically, a table summarising the changes following the template provided as Table 4-1 will be developed. This table will clearly indicate location and reason/s for changes. A tracked change version of the revised GWMP will be provided for all minor, non-structural changes to the document.

Table 4-1: GWMP review template

Complexity of changes	Minor revisions ☐	Moderate revisions ☐	Major revisions ☐	
Number of key environmental factors	One ☐	2-3 ☐	> 3 ☐	
Date revision submitted to EPA	DD/MM/YYYY			
Proponent's operational requirement timeframe for approval of revision	< One Month ☐	< Six Months ☐	> Six Months ☐	None ☐
Reason for Timeframe				

Item number	GWMP section number	GWMP page number	Summary of change	Reason for change
1.				
2.				
3.				

5 Stakeholder consultation

Consistent with the EPA's expectations for this GWMP to align with the principles of EIA, BNR consulted with stakeholders, including the Department of Water and Environmental Regulation (DWER), during the development of the EPA referral. Engagements relevant to this GWMP are presented below in Table 5-1.

Table 5-1: Stakeholder engagement relevant to this GWMP

Stakeholder	Method of engagement	Date of engagement	Summary of engagement
Department of Communities	Email	08 Nov 2021	Enquired if the Yungngora Community groundwater bore data for the Poole Sandstone aquifer (provided by the Department) could be made publicly available in the ERD. The Department declined. As an action, BNR have compared the data and instead summarised similarities/differences without disclosing any data.
Department of Communities	Email	09 Jun 2021	Requested drinking water data from the groundwater bores monitored at the Yungngora Community, to obtain information from the deeper aquifers.
DWER	Meeting	09 Jun 2021	Continued discussion regarding the proposed groundwater monitoring program. DWER requested that background information on the underlying Poole Sandstone and Grant Group aquifers should be included in the ERD.
EPA	Phone	04 Jun 2021	Discussed baseline monitoring requirements from the draft ESD, and requested to remove the requirement to sample at each well site for a period of 24 months, and change to sampling representative control sites for a period of 24 months.
DWER	Phone	03 Jun 2021	Arranged a meeting to discuss DWER's feedback on the proposed Valhalla baseline groundwater monitoring program.
DWER	Email	26 May 2021	Discussed the suitability of the Valhalla baseline groundwater monitoring program, with regard to monitoring control sites only within the Liveringa Aquifer. Questioned that the other deeper aquifers must be discussed.
Noonkanbah Station manager	Phone	13 May 2021	Discussed the availability of bore logs from pastoral bores on the station; unofficial bore logs could be made available. Re-confirmed that BNR could sample water from the pastoral bores by unscrewing pipes or opening taps. Mentioned that access roads and fence line tracks would be graded at the end of May, and mustering activities would commence early June.
Blina Station manager	Phone and email	23 Mar 2021	Discussed sampling station bores for the baseline groundwater monitoring program – station accepted. Discussed the availability of a bore log for a bore located on Blina Station. Confirmed that BNR could sample water from that bore by opening the tap.
DWER	Email	22 Mar 2021	Reviewed sampling methodology and locations for baseline control site groundwater monitoring program. Enquired about availability of bore logs and any existing data for any pastoral bores.
Noonkanbah Station manager	Phone and email	08 Mar 2021	Discussed sampling station bores for the baseline groundwater monitoring program – station accepted. Enquired about the availability of bore logs from pastoral bores on the station. Confirmed that BNR could sample water from the pastoral bores.

For a full summary of stakeholder engagement records refer to the BNR Environmental Review Document (BNR_HSE_MP_013). Any additional consultation regarding this GWMP will be captured in subsequent revisions.

6 References

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Appendix N. Public Health Risk Assessment

Human Health Risk Assessment

Valhalla Gas Exploration and Appraisal Program

BNR_HSE_MP_017

VERSION HISTORY				
Ver. No.	**Ver. Date**	**Author**	**Reviewer**	**Revision**
0	14 Dec 2021	AdV	SKR, AF	For peer review
1	10 Jan 2022	AdV	AF	For EPA submission

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Acronym / abbreviation

Terms / acronym	Definition / expansion
BNR	Bennett Resources Pty Ltd
CoPC	Constituent of potential concern
DoH	Department of Health
EP Act	*Environmental Protection Act 1986*
EPA	Environmental Protection Authority
ERD	Environmental Review Document
ESD	Environmental Scoping Document
Ha	hectares
HFS	Hydraulic fracture stimulation
HHRA	Human Health Risk Assessment
km	kilometres
m	meter
PM	Particulate matter
Proposal	Valhalla Gas Exploration and Appraisal Program
TO	Traditional Owner
VOC	Volatile Organic Compounds
µg	micrograms

1 Overview

Bennett Resources (BNR) has prepared a site-specific Human Health Risk Assessment (HHRA) for the Valhalla Gas Exploration and Appraisal Program (the Proposal). The requirement to undertake a HHRA risk assessment was specified by the Environmental Protection Authority (EPA) in the Environmental Scoping Document (ESD), ESD requirement #52 for the environmental factor Social Surroundings:

Provide a peer-reviewed, site-specific human health risk assessment, addressing potential short and long-term health impacts of the proposal that addresses health risks from:

a. *airborne chemicals;*
b. *chemicals proposed to be used in drilling and hydraulic fracture stimulation;*
c. *fluids and those expected to be present in produced or flowback water;*
d. *storage and handling of drilling and hydraulic fracture fluids; and*
e. *storage and disposal of drilling and hydraulic fracturing flowback fluids (including wastewater).*

Note: peer-reviewed, site-specific human health risk assessments will be provided to the Department of Health for comment.

The interest and scrutiny arise from the development of a new unconventional project following the lifting of the HFS (hydraulic fracture stimulation) moratorium and the lack of public knowledge relating to impacts and risks associated with the project in region of the West Kimberley. Prior to undertaking the Proposal, the scope of potential impacts to the public that may emerge needs to be understood, verified and shared with stakeholders, as well as with the public during the Section 38 referral under the *Environmental Protection Act 1986* (EP Act). This HHRA will define the scope of impacts to public health in a site-specific context for the Proposal, based on a risk-based framework approach.

The closest relevant human receptor, an Indigenous Community, is aware and supportive of the Proposal. They are currently knowledgeable of the risks to the environment and of the chemical sources arising from the Proposal given in the past they have supported and worked for a similar unconventional project, now part of Bennett Resources' existing assets. Community members and associated workers such as pastoralists travelling within the Proposal's area understand that they are not considered susceptible or vulnerable populations likely to be exposed by the Proposal's activities.

With the extensive environmental awareness and the depth of hydrogeological knowledge of the local and regional setting, all transport mechanisms have been adequately considered. It must be highlighted that all potential pathways were explored during the preparation of this HHRA, and that the feasible and reasonable pathways and thus associated risks are the focus of this risk assessment. Where necessary, where other exposure media and pathways were not detailed, the HHRA has clarified why these were not feasible for detailed inclusion in the HHRA. This HHRA will be included in the Proposal's Environmental Review Document (ERD) for assessment by the EPA.

2 Methodology

This HHRA has been prepared in accordance with the Health Risk Assessment (Scoping) Guidelines (DoH 2010). The guidelines provide a framework for the health risk assessment component for Environmental and Health Impact Assessment processes. Specifically, the guideline is used to determine if a detailed Health Impact Assessment is required.

BNR used this process to determine which (if any) Health Hazards and subsequent Health Impacts required further detailed assessment. Procedurally, this HHRA follows a standard risk assessment approach (Figure 2-1) being:

- the activity is detailed and key issues identified relevant to the risk assessment
- hazards associated with the activities are identified
- exposure pathways associated with the hazards are identified
- the adverse effects to human health (Impacts) arising from exposure are defined
- consequence mitigation identified

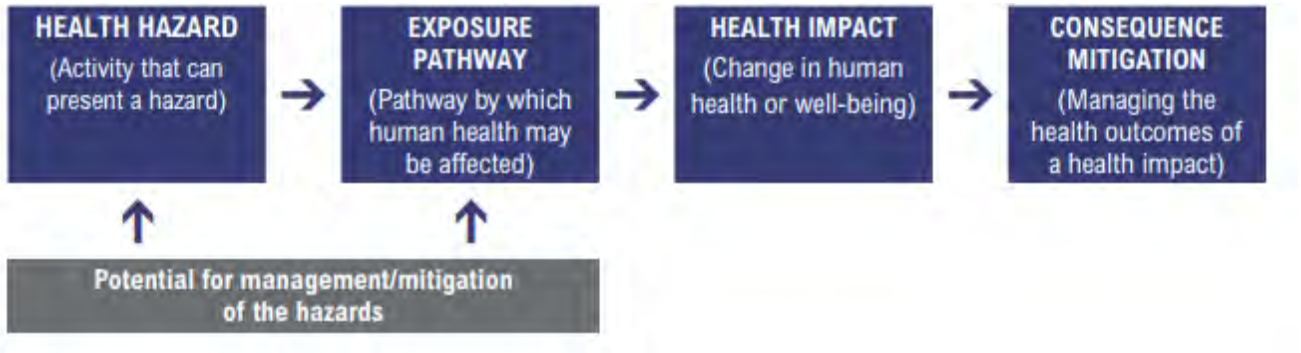

Figure 2-1: Links between health hazards and health impacts (DoH 2010)

All stages of the HHRA model are closely linked, and thus the outcomes of one stage of the assessment may affect the progression or outcomes of the subsequent assessment stage. As with all BNR risk assessments, a precautionary principle / approach has been considered applied to manage any uncertainty in the HHRA.

2.1 Project Context

2.1.1 Location and existing land use

The Proposal is located on the active Blina and Noonkanbah pastoral stations, on the Warlangurru and Noonkanbah Native Title Areas, respectively. Yungngora People of the Yungngora Community are employed by Noonkanbah Station and regularly travel on the station to verify cattle presence, feedstock, groundwater pastoral bore operation and associated watering troughs. Blina Station workers occasionally travel to the southern border of Blina Station which intersects the northern section of the Development Envelope to verify their cattle and station equipment. Cattle are free roaming, and pastoralists use existing station and BNR tracks to access specific areas of the station all throughout the Development Envelope

In addition to pastoral activities, the Traditional Owners (TOs) of the land and members of the Yungngora Community, including some Warlangurru People residing at the Jimbalakudunj Community, use the land within and surrounding the Development Envelope for cultural practices, such as hunting and gathering of traditional foods, initiations and education. The land in this region is also used for recreational purposes such as swimming and fishing. The TOs are made aware of all BNR presence and activities on the permit, with sufficient notice and engagement prior to undertaking any activities and visits to the sites.

2.1.2 Receptor Analysis

Receptors relevant to the scope of this HHRA have been grouped into two categories:

- Fixed
- Non-fixed
- Out of scope.

Fixed

BNR has defined fixed receptors as locations where humans are known to reside or be present for long periods of time. For the purpose of this assessment these include:

- the Jimbalakudunj Community – located ~20 km from the nearest proposed well site and the general Development Envelope
- the Yungngora Community – located ~28 km from the nearest proposed well site and ~20 km from the general Development Envelope

The Jimbalakudunj Community, although located closer to proposed well sites than the Yungngora Community, was not identified as a receptor of the identified potential health hazards. However, the members of the Jimbalakudunj Community travel along the permit road to access the Yungngora Community and attend meetings, particularly as Warlangurru People reside in both communities, however do not often use the land itself for other reasons. Given the distance to the proposed activities and to any of the hazards, with separation from the Great Northern Highway, no exposure pathways have been associated with the Jimbalakudunj Community as a fixed receptor.

No other tourist or public access locations are present within the Development Envelope, thus no other locations are known where humans have the potential to reside or be present for a long period of time.

Non-Fixed

The existing land use throughout the Development Envelope is pastoral use. Consequently, any pastoral station worker conducting activities throughout the station has the potential to be non-fixed receptor. For context Blina Station comprises a total area of 254,600 ha. Noonkanbah Station covering the majority of the Development Envelope comprises a total area of 172,400 ha and employs less than 10 people, with the number of workers generally doubling during the mustering season. Approximately four Yungngora locals are employed by the station. Given that the disturbance footprint of this Proposal is limited to 109 ha, the potential direct impact is limited to <0.03% of the total pastoral stations.

To further define the non-fixed receptors, pastoralists verifying the operation of pastoral bores, which may include touching the bore equipment and bore water, have been identified as those closest to the exposure pathway for non-fixed receptors. In addition to pastoral use, as stated in Section 2.1.1, TOs use the land within and surrounding the Development Envelope for cultural practices and recreational purposes. TOs utilising the land for such reasons may be defined as non-fixed receptors. Specific cultural locations where TOs may occasionally frequent are not located in close proximity of the Proposal's disturbance footprint. Consultation with the TOs has shown that BNR is aware of these areas of cultural importance to the community members.

As the Calwynyardah-Noonkanbah Road runs through the Development Envelope, this has been considered another non-fixed receptor as users of the Calwynyardah-Noonkanbah Road do not reside in this specific area nor are located along the road for a long period of time. As direct exposure to any road user is not expected, this receptor has not been considered further.

Out of scope

As detailed in Section 5.4.3.6 of the Environmental Review Document (BNR_HSE_MP_013) there are no permanent water bodies within the Development Envelope. The Mount Hardman Creek is a non-perennial water body and only flows during the wet season. As there is no vulnerable shallow aquifer in communication with seasonal creeks the use of such waterbodies will not result in any exposure, thus it has not been considered further.

2.2 Step 1 – Hazard

As defined by DoH, a Health Hazard is defined as:

The elements of an organisation's activities that present a hazard or source of risk to health or well-being and may be an event, incident or circumstances. They are activities or elements of a proposal that can interact with human health to represent a risk to health or well-being. Examples are air or water emissions, noise and displacement or relocation of people (DoH 2010).

To understand the potential health hazards associated with the Proposal, BNR developed a conceptual model which is presented in Figure 2-2. This model identifies the Health Hazards for the Proposal as being limited to:

- air emissions
- groundwater emissions
- soil contamination.

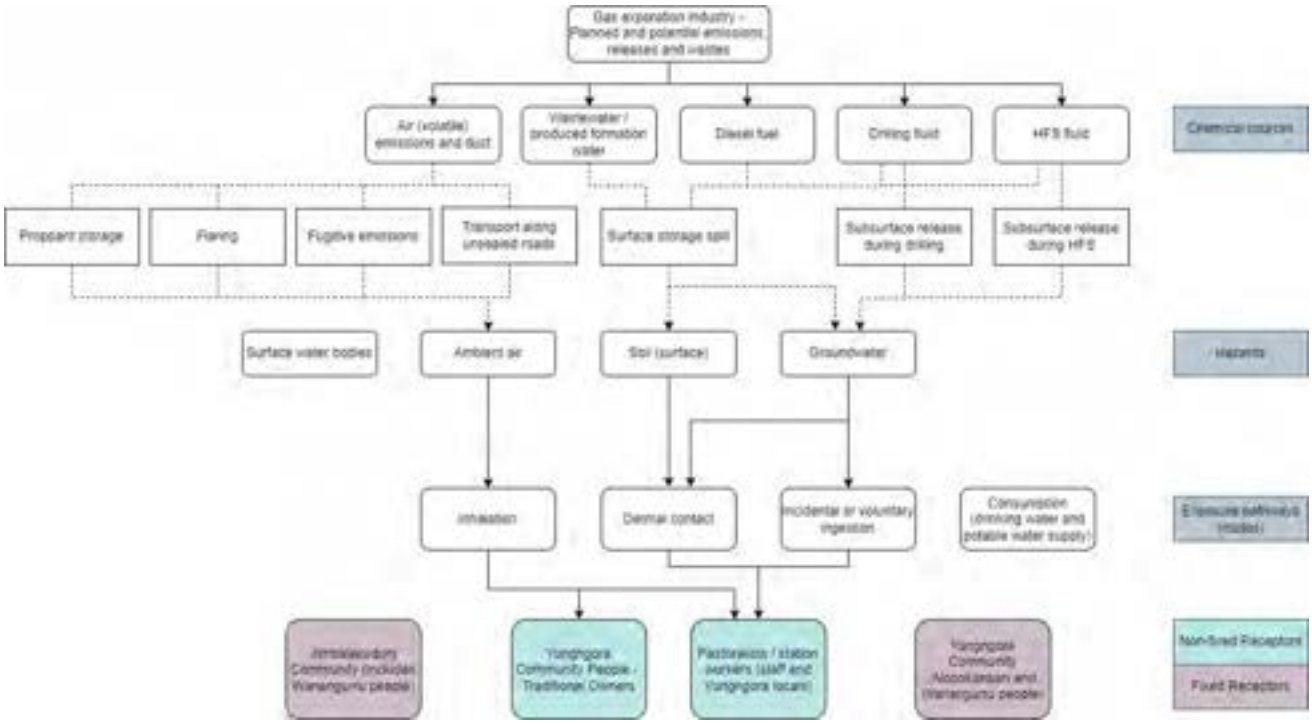

Figure 2-2: Site-specific conceptual site model illustrating the source – pathway – receptor analysis undertaken for the HHRA

2.3 Risk Assessment Process

The risk assessment process undertaken for the Proposal was completed following four steps:

- Step 1 the identification of the hazards
- Step 2 defines the feasible pathways from each of the hazards
- Step 3 determines the potential health impacts from the hazards through the identified exposure pathways
- Step 4 consists of the risk assessment itself.

The consequence of the described health impact is defined, whereby the magnitude of the impact is detailed, in qualitative or quantitative terms. Once the consequence defined, the likelihood of the consequence is determined, where the frequency and probability of the consequence occurring is evaluated, in qualitative or quantitative terms. The combination of the consequence and the likelihood of that particular consequence occurring results in the inherent health risk level for the specific hazard. The risk level is considered as an

indication of the significant of a health or well-being impact. If required, depending on this risk level, risk management criteria (management of mitigation measures required to reduce negative impact of enhance positive impact) may be applied in order to reduce the risk to human health.

2.3.1 Step 2 – Exposure

An exposure assessment was initially undertaken for each of the hazards in accordance with the DoH Health Risk Assessment (Scoping) Guidelines (DoH 2010) and in consideration with the principles set out in the DoH environmental health risk assessment process (enHealth 2012).

As defined by DoH, an exposure is defined as:

The Pathway by which human health may be affected (DoH 2010).

Given that the sources of hazards are clearly understood (refer to Section 3.1, Section 3.2 and Section 3.3), assessment of exposure to these sources was completed by considering the receptors with the potential to be exposed and consideration as to the magnitude, frequency, and duration of potential exposure (WHO 2004).

2.3.2 Step 3 – Health Impact

An impact (or risk) assessment was undertaken for each of the hazards in accordance with the DoH Health Risk Assessment (Scoping) Guidelines (DoH 2010) and in consideration with the principles set out in the DoH environmental health risk assessment process (enHealth 2012).

As defined by DoH, health impacts are defined as:

the overall effects, direct or indirect, of activities on the health of a population. The variation and vulnerability among sectors of the population need to be considered (DoH 2010).

2.3.3 Step 4 – Risk Assessment

Consistent with DoH guidelines (DoH 2010), BNR assessed the:

- Consequences, in accordance with the definitions provided in Table 2-1
- Likelihood, in accordance with the definitions provided in Table 2-2
- Risk Level, in accordance with the definitions provided in Table 2-3
- Risk Management Criteria, in accordance with the definitions provided in Table 2-4.

Table 2-1: Categories for Health Consequences (source (DoH 2010))

Category	Acute Health Consequences (per Hazard or outbreak)	Chronic Health Consequences(per Project Lifecycle)
Catastrophic 1	>1 fatality OR >5 permanent disabilities OR Non-permanent injuries requiring hospitalisationfor 5–10% of population at risk OR Acute health effect requiring hospitalisation for >5-10% of population at risk	Chronic health effect requiring medical treatment for 10–15% of population at-risk*
Massive 2	1 fatality OR 2–5 permanent disabilities OR Non-permanent injuries requiring hospitalisationfor 2–5% of population at risk OR Acute health effect requiring hospitalisation for	Chronic health effect requiring medical treatment for 5–10% of population at-risk*

	>2–5% of population at risk	
Major 3	No fatality AND (1 permanent disability OR Non-permanent injuries requiring hospitalisationfor >1–2% of population at risk OR Acute health effect requiring hospitalisation for >1–2% of population at risk OR Evacuation is necessary)	Chronic health effect requiring medical treatment for 2–5% of population at-risk*
Moderate/ Significant 4	No fatality AND No permanent disability AND (Non-permanent injuries requiring hospitalisation for 1–2% of population at risk OR Acute health effect requiring hospitalisation for1–2% of population at risk AND No evacuation	Chronic health effect requiring medical treatment for 1–2% of population at-risk*
Minor 5	No fatality AND No permanent disability AND (Non-permanent injuries requiringhospitalisation for 1–5 persons OR no acute health effect requiring hospitalisation) AND No evacuation	Chronic health effect requiring medical treatment for about 0–1% of population at-risk*
Negligible/slight 6	No fatality AND No permanent disability AND No non-permanent injuries requiringhospitalisation AND No acute health effect requiring hospitalisation AND No evacuation	No chronic health effect requiring medical treatment

Table 2-2: Likelihood Categories for Health Impact Assessments (source (DoH 2010))

Likelihood Descriptor		Frequency of Incident or outbreak with Non-Chronic Health Effect	% Chance of Chronic Health Effect during life of project
1	Rare/remote	Once in more than 10 years	Up to 5%
2	Unlikely	Once in 5 – 10 years	6 – 30%
3	Possible/ occasionally	Once in 3 – 5 years	31% – 60%
4	Likely	Once in 1 to 3 years	61% – 90%
5	Almost certain	More than once a year	Over 90%

Table 2-3: Qualitative Risk Matrix for Health Impact Assessments (source (DoH 2010))

	Consequences					
Likelihood	Slight/ negligible	Minor	Moderate	Major	Massive	Catastrophic
Almost Certain	Low	Medium	High	Extreme	Extreme	Extreme
Likely	Low	Low	Medium	High	Extreme	Extreme
Possible	Very Low	Low	Low	Medium	High	Extreme
Unlikely	Very Low	Very Low	Low	Low	Medium	High
Rare/remote	Very Low	Very Low	Very Low	Low	Low	Medium

Table 2-4: Risk management criteria according to risk rating at scoping stage (source (DoH 2010))

Risk Rating	Risk Mitigation/Management Criteria
Extreme	Potentially unacceptable: modification of proposal required
High	Major mitigation/management (including offsets) may be required – Assessment required of health hazards
Medium	Substantial mitigation/management required – Assessment required of health hazards
Low	Some mitigation/management may be required – No detailed assessment of health hazards required butaddressed with routine controls
Very Low	No further assessment required

2.4 Peer Review

BNR engaged Geosyntech consultants (Geosyntech) to complete a review of this HHRA. BNR sent through Revision 0 to Geosyntech to which a response was provided (included as Appendix A). In summary Geosyntech provided the following recommendations (Summarised):

- BNR consider Surface Water Resources, and describing these even if no exposure pathway existed
- To include more information on Constituents of Potential Concern (COPC)
- To discuss surface release and exposure to groundwater systems

In summary, Geosyntech stated:

Overall, the study is very close to complete, is well ordered, easy to follow, and consistent with relevant administrative authority guidelines. Excepting additional discussion regarding the projected nature and extent of proposal CoPCs, and in recognition of the very low potential for exposure to populations outside Valhalla Gas workers, it is unlikely that a more detailed and comprehensive HHRA will be required.

BNR addressed the recommendations from Geosyntech in Revision 1 of this HHRA.

3 Health Risk Assessment

3.1 Air

3.1.1 Hazard

Exposure to air emissions is limited to dust emissions and volatile organic compunds (VOCs).

The health hazards (activities that can present a hazard and interact with human health) from air include:

- VOCs and dust from transport along unsealed roads / tracks
- Dust from proppant (fine sand) storage on site
- VOCs and products of incomplete combustion (PICs) from flaring during well testing activities on site
- VOCs as fugitive emissions from the well following completion of HFS activities.

These health hazards will be limited to the duration of the activities at each well site and transport along the roads and tracks during mobilisation and demobilisation of the Proposal equipment.

3.1.2 Exposure

Monitoring from other programs have demonstrated that VOCs rapidly dissipate upon release with no ground level exposures above human health criteria/screening levels (Ramboll 2019). As such, no further consideration of human health impacts from VOCs have been considered given there is no potential exposure to Fixed or Non-fixed receptors.

As such, health impacts associated with changes to ambient air are associated with the following pathway:

- Inhalation (respiratory system) associated with dust from sand storage onsite.

BNR reviewed the Proposal's Chemical Inventory (Appendix A of the Valhalla Environmental Review Document [BNR_HSE_MP_013]) to identify products that contained:

- suspected carcinogens
- mutagens,
- developmental toxicants and endocrine disruptors.

These were then further refined to understand those products that pose a human health risk via inhalation. Specifically for the water-based drilling fluid, cementing system and HFS fluid, the following Constituents of Potential Concern (CoPC) were identified as posing a human health risk:

- Silica.

Silica can be measured onsite through monitoring of particulate matter (PM). Baseline studies identified a range of environmental concentrations for $PM_{2.5}$ and PM_{10} onsite dependant on various environmental conditions. The Valhalla Monitoring Plan (Appendix C of the Valhalla Environmental Review Document [BNR_HSE_MP_016]) details 24-hour average – Health indicators for $PM_{2.5}$ and PM_{10}. BNR will monitor for these over the course of the Proposal.

As detailed in Section 5.5.3.1 of the ERD, the closest public communities (Aboriginal communities) are located 20 km and 28 km from the closest proposed well sites within the Development Envelope. No other fixed sensitive human receptors are known to occur within the Development Envelope.

Consequently, no exposure to fixed receptors is expected to arise from dust emissions associated with the Proposal.

As stated in Section 2.1.2, pastoral workers and travelling Yungngora Community TOs have the potential to be present within the Development Envelope over the course of the Proposal. These workers and people using the land for traditional purposes are considered Non-fixed receptors and exposure would only occur in the event they were located within proximity of the well site during HFS activities. As dust from the proppant storage is

expected to be influenced by the weather and wind conditions, and as baseline monitoring has indicated existing PM levels within the Development Envelope fluctuate due to the weather conditions, the change to ambient air quality levels is not expected to be significant.

3.1.3 Impact

It is well established that dust emissions can have adverse impacts (adverse changes) on human health. These health impacts can be both short-term (acute) and long-term (chronic). Dust particles (i.e. in the PM_{10} and $PM_{2.5}$ size ranges) including fine sand particles that are readily inhaled are associated with a range of chronic health effects. Both fine and coarse dust particles can cause acute health effects (e.g. eye or breathing irritation) and also deposit and remain on surfaces leading to soiling.

Further to this, a completed HHRA, in accordance with DoH guidelines (DoH 2010), is provided in Table 3-1.

Table 3-1: Human Health Risk Assessment – Air

	Description
Consequence	The generation of dust on unsealed roads already occurs within the Development Envelope from community members travelling to and from the Yungngora and Jimbalakudunj Communities, and from pastoral activities along existing access tracks and transportation of cattle using road trains on the unsealed Calwynyardah-Noonkanbah Road. Current PM_{10} dust levels along the road often exceed the daily health guideline levels of 50 µg/m^3 most days of the week. Dust resulting from the Proposal will only increase the current dust concentrations along the Calwynyardah-Noonkanbah Road during transportation of equipment to and from the well sites, and specifically on parts of the road located at least >20 km away from the closest community. Proppant, or frac sand, is expected to be stored on each well site and protected from wind and equipment that may disturb the sand. The mechanical handling of sand for storage on site and during the preparation of HFS fluid may generate dust that can temporarily disperse to the exterior of the well site fences. Given the distance to potential Non-fixed human receptors in the Development Envelope, the temporal nature of their presence in the area, and as the Proposal has more separation than recommended in accordance with EPA Guidance (EPA 2005), the Proposal is not expected to result in any chronic health effects requiring medical treatment.
Likelihood	In accordance with DoH guidelines, BNR does not believe that the Proposal would result in one event / incident of chronic health in more than 10 years and consequently the likelihood of exposure is considered rare / remote. The reason to this is that the public (including TOs from the Yungngora Community and pastoralists) is restricted from site access, and exposure will be limited to the duration of the activity which will be limited to months (at each well site). Consequently, the duration of exposure will be limited, the extent to which humans can be exposed is limited and the nature of the exposure (as detailed in Section 5.6.3 in the ERD) is limited.
Inherent Risk Level	Based upon the DoH qualitative Health Impact Assessment risk matrix, the level of risk is: **Very Low**.
Uncertainty	BNR has completed monitoring of existing dust and VOC air quality within the Development Envelope. Consequently, during the implementation of the Proposal, BNR will be able to monitor the changes to air quality associated with the Proposal. Given the robust amount of baseline data combined with the proposed monitoring program and actions in Appendix C of the ERD, there is limited uncertainty associated with the Proposal.
Health Risk management	Based upon the DoH risk management criteria, no further assessment is required.

3.2 Groundwater

3.2.1 Hazard

Exposure to groundwater is limited to CoPCs that may reach Liveringa Aquifer groundwater used by pastoral station bores screened in the same aquifer. The health hazards (activities that can present a hazard and interact with human health) from groundwater include:

- surface release of drilling fluids and HFS fluids
- subsurface release of drilling fluids
- subsurface release of HFS fluids.

3.2.2 Exposure

Groundwater contamination is associated with unplanned events, specifically relating to drilling or HFS fluid systems. Groundwater exposure to humans is limited to those events that reach the Liveringa Aquifer groundwater used by pastoral station bores screened in the same aquifer. The closest utilised pastoral bores are located >1.5 km away from the closest proposed well site.

Although the release of subsurface HFS fluids was identified as a chemical source, HFS fluids will only have the potential to be released along the HFS zones between 2,000 m and 5,000 m below ground. As such, any release would be contained by the thick shale layers from the Laurel and Anderson formations as described in Section 5.4.5.4 of the ERD. With over 1.5 km separation between the targeted Laurel Formation during HFS activities and any Community bores used for potable water screened in the Poole and Grant aquifers, a subsurface release of HFS fluids was not considered to result in a feasible exposure pathway.

The release of drilling fluids to an aquifer is only a hazard whilst drilling through the Liveringa Aquifer. As detailed in Section 5.4.5.2 of the ERD, BNR are required to utilise low-toxicity water-based drilling fluids when installing the surface casing. Once the surface casing is installed, there is no risk of drilling fluid loss as the surface casing provides a barrier between the drilling fluids and the aquifer. Consequently, the health hazard from groundwater specifically includes:

- Lost circulation events causing contamination of groundwater during the installation of the surface casing (drilling activity).

As stated in Section 2.1.2, pastoral workers and community members traditionally using the land have the potential to be present within the Development Envelope over the course of the Proposal. These people are considered Non-fixed receptors and exposure would only occur if:

- an unplanned release of drilling fluids occurred during installation of the surface casing
- the pastoral bores are located down gradient of the well site
- pastoral bores were in operation and CoPCs were pumped to the surface

Consequently, exposure to contaminated groundwater is extremely unlikely. However, should this occur, health impacts associated with changes to groundwater are limited to the following pathways:

- dermal contact
- incidental and voluntary ingestion

Consumption (drinking water) has been differentiated from incidental or voluntary ingestion, and was not considered further given that the surficial Liveringa Aquifer is not used for potable water purposes or for Community water supplies. The pathway ‘incidental or voluntary ingestion’ was considered given that pastoral workers are known to drink raw bore water whilst working, and TOs may know the location of these pastoral bores and use the water if needed when hunting and roaming in the permit area.

BNR reviewed the Chemical Inventory (Appendix A of the Valhalla Environmental Review Document [BNR_HSE_MP_013]) to identify products that contained:

- suspected carcinogens
- mutagens,
- developmental toxicants and endocrine disruptors.

These were then further refined to understand those products that pose a human health risk via dermal contact or ingestion. Specifically for the water-based drilling fluid, cementing system and HFS fluid, the following COPC were identified:

- Nitrilotriacetic acid, trisodium salt monohydrate
- Sulfuric acid

The outcomes of local groundwater characterisation is included as Appendix H of the Valhalla Environmental Review Document (BNR_HSE_MP_013). These studies identified a range of environmental concentrations for relevant CoPCs, including chloride and sulfate. These ranges indicate levels are relatively steady throughout the Development Envelope. Concentrations will continue to be monitored and management actions undertaken in accordance with the trigger and threshold criteria detailed in the Groundwater Management Plan (Appendix I of the Valhalla Environmental Review Document [BNR_HSE_MP_015]).

As detailed in Section 5.4.5.5 of the Environmental Review Document (BNR_HS_MP_013), based on the depth to groundwater, any surface release is expected to take 70–300 days to travel from the ground surface to the water table (Rockwater 2016). With the mitigations in place, BNR did not deem this a credible hazard, thus it has not been considered any further.

3.2.3 Impact

It is well established that the quality of groundwater, when used for drinking purposes, can have adverse impacts on human health. These health impacts can be both short-term (acute) and long-term (chronic) depending on the CoPCs, the concentration of CoPCs and the duration of consumption of water. Although Liveringa Aquifer groundwater is not extracted and drunk as potable water, or stored for potable water supplies for communities or residences, as discussed in Section 3.2.2, only dermal contact and incidental or voluntary ingestion of non-treated non-potable bore water have been identified as feasible exposure pathways for groundwater. Dermal contact with non-treated bore water with higher concentrations of CoPCs may potentially lead to skin irritations, including skin dryness. Incidental or voluntary ingestion of non-treated bore water, in general, may result in aesthetically displeasing tastes and potentially temporary upset stomachs, based upon the expectation that a limited amount of bore water is ingested occasionally.

Further to this, a completed HHRA, in accordance with DoH guidelines (DoH 2010), is provided in Table 3-2.

Table 3-2: Human Health Risk Assessment – Groundwater

	Description
Consequence	A local and regional groundwater characterisation of the Liveringa Aquifer, including of the CoPCs identified as indicator constituents for drilling fluid, has shown that groundwater quality varies within the Development Envelope. Previous operational and surveillance monitoring on site during similar drilling operations in the Development Envelope showed no significant variation in CoPC data that was attributable to drilling activities. With the limited amount of drilling fluid potentially released at the subsurface, the dilution of CoPCs, and the migration of any CoPCs to the location of pastoral bores, the quality of the groundwater abstracted away from any of the well sites (>1.5 km) is not expected to differ from natural variations. Similar petroleum industry activities occur around the state, where low-toxicity drillings fluids are used. Low-toxicity drilling fluids are planned to be used by BNR that are not expected to result in environmental impacts, nor health impacts. Given the distance to the Non-fixed TO receptors using the whole permit area, and their infrequent presence around the pastoral bores, the Proposal is not expected to result in any chronic health effects to TOs using the land for cultural or recreational purposes, that would require medical treatment.

	Despite the more regular presence of station workers around the pastoral bores and frequency of contact with bore water, the Proposal is still not expected to result in any chronic health effects to station workers that would require medical treatment.
Likelihood	In accordance with DoH guidelines, BNR does not believe that the Proposal would result in one event / incident of chronic health in more than 10 years and consequently the likelihood of exposure is considered rare / remote. The reason to this is that the community members are not expected to use or touch groundwater from pastoral bores unless needed in case of thirst, given their remote location within the bush in the Development Envelope away from the Community residences. Additionally, pastoralists are aware that the groundwater abstracted from their bores are for cattle watering purposes. Pastoralists will regularly clean and maintain the cattle troughs where bore water is run through. Voluntary drinking directly from the bore pump pipe is common during station activities. As such, the dermal and ingestion exposures are limited to if and when these Non-fixed receptors are purposefully visiting the pastoral bores. Consequently, the duration of exposure will be limited, the extent to which the public can be exposed is limited and the nature of the exposure (as detailed in the Consequence section above) is limited.
Inherent Risk Level	Based upon the DoH qualitative Health Impact Assessment risk matrix, the level of risk is: Very Low.
Uncertainty	The previous operator of the permit completed groundwater monitoring on bores within existing well sites that underwent drilling and HFS activities, which showed no significant variation in CoPC data that was attributable to drilling activities. BNR has completed further groundwater monitoring, including baseline monitoring within the Development Envelope to further understand the existing groundwater quality of the Liveringa Aquifer (in which pastoral bores are screened and in which Proposal monitoring bores will be screened) within the Development Envelope. Consequently, during the implementation of the Proposal, BNR will be able to monitor if any changes to groundwater quality associated with the Proposal occur. Given the robust amount of baseline data combined with the proposed monitoring program and actions in Appendix C of the ERD, there is limited uncertainty associated with the Proposal.
Health Risk management	Based upon the DoH risk management criteria, no further assessment is required.

3.3 Soil

3.3.1 Hazard

Soil contamination has the potential to occur from an unplanned release (spill event) on site over the course of the Proposal. Specifically, the onsite surface spill events may include spills from:

- drilling fluids
- HFS fluids during pumping
- wastewater – produced formation water
- diesel fuel storage.

3.3.2 Exposure

Exposure to humans is limited to those events that result in contamination outside of the well site. With the exception of well site access tracks (that are likely to be used for pastoral access once installed), the closest Non-fixed receptors (pastoral workers) who would be regularly visiting the area surrounding the well sites would be located ~1.5 km away given this is the distance to the closest pastoral bore.

This health hazard will be limited to each well site and the immediate perimeter (i.e. the firebreaks) during operation of the Proposal. The current pastoral activity within the Development Envelope around all proposed well sites is limited to cattle grazing. The land is not used for other agricultural reasons and is not used from crop growth for human consumption.

These station workers are considered Non-fixed receptors and exposure would only occur if:

- an unplanned release occurred that resulted in contamination outside of the well site

- the station workers were on-site at the time of release.

Consequently, exposure is extremely unlikely. However, should this occur, health impacts associated with changes to soil are limited to the following pathways:

- dermal contact.

3.3.3 Impact

Dermal contact of contaminated soil with higher concentrations of CoPCs may lead to skin irritations, including skin dryness. Dermal contact may also lead to dermal absorption of CoPCs from soil. Impacts would be expected to be acute (short-term), and dependant by a variety of physical and chemical factors, including the type of CoPCs, the soil-chemical contact time, the degree of chemical saturation of the CoPCs in soil, the area of exposed skin, continuity/duration of soil-skin contact (exposure time), the amount of soil adhering to the skin and the amount of contaminant absorbed through the skin (NEPC 1999).

The substances for which dermal contact from soil and associated impacts are most likely to be significant are lipophilic compounds that are relatively long lived in the environment, accumulate in the body, and present a chronic (e.g., carcinogenic) risk (Spalt, et al. 2009).

Further to this, a completed HHRA, in accordance with DoH guidelines (DoH 2010), is provided in Table 3-3.

Table 3-3: Human Health Risk Assessment – Soil

	Description
Consequence	As detailed in the ERD in Section 5.2.3.2 and in the human health hazard for soil in this HHRA, spills from drilling fluids, produced formation water and diesel fuel have the potential to contaminate soil and affect Non-fixed receptors. On this basis, the analytes considered both as indicators of spill events and as CoPCs for human health are Total Recoverable Hydrocarbons from diesel, Barium, Chloride, Cadmium and Chromium III from drilling fluids, HFS fluids and produced formation water. Similar petroleum industry activities occur around the state, where low-toxicity drillings fluids are used. Low-toxicity drilling fluids are planned to be used by BNR that are not expected to result in environmental impacts, nor health impacts. Regional baseline soil quality sampling, including for the above CoPCs, have shown that soil quality varies throughout the Development Envelope. Should a spill event occur on site during operations and contamination occur outside of the well site, this would result in the presence and/or increase of these specific CoPCs in soil prior to BNR immediately implementing management measures and remediation of the contaminated soil. Dermal contact with the CoPCs characteristic of the chemical sources is not expected to result in significant health impacts, primarily due to the nature of the exposure pathway and the very temporal nature of the exposure. Contact with these CoPCs will result in irritation and sensitization only if the skin contact is prolonged. Given the predicted distance to Non-fixed sensitive receptors at least 1.5 km away, the frequency of their presence in the surrounding area (approximately once a week), and the unlikely long-term skin exposure should a spill event occur, the Proposal is not expected to result in any chronic health effects requiring medical treatment.
Likelihood	In accordance with DoH guidelines, BNR does not believe that the Proposal would result in one event / incident of chronic health in more than 10 years and consequently the likelihood of exposure is considered rare / remote. The reason to this is that the public is restricted from site access, the hazards are unlikely to go beyond the delimitation of the well sites, and remediation of any hazard is planned to occur as soon as possible to limit impacts to the environment in the first instance. Consequently, the duration of exposure will be limited, the extent to which the public can be exposed is limited and the nature of the exposure is limited.
Inherent Risk Level	Based upon the DoH qualitative Health Impact Assessment risk matrix, the level of risk is: **Very Low**.
Uncertainty	BNR has undertaken baseline soil monitoring within the Development Envelope to understand the existing soil quality of the different soils within region. Consequently, during the implementation of the Proposal, BNR will be able to monitor if any changes to soil quality associated with the Proposal occur. Given the robust amount of baseline data combined with the proposed monitoring program and actions in Appendix C of the ERD, there is limited uncertainty associated with the Proposal.

Health Risk management	Based upon the DoH risk management criteria, no further assessment is required.

4 Conclusions

This HHRA has presented plausible evidence of the exposure pathways linking the source of contamination and the exposed receptors. With the exception of air emissions (associated with dust generation), all exposure mechanisms are based upon unplanned events that are well understood in the industry with suitable management and consequence mitigation measures in place.

All risks were deemed to be very low according to characterisation in accordance with the DoH risk matrix, which determined that no further risk characterisation is required.

No specific human health risk management or the implementation of mitigation measures are necessary and this is consistent with advice from the Department of Health that indicate that detailed Human Health Risk Assessment is required when the source of the risk is located within close proximity of sensitive receptors.

This Human Health Risk Assessment demonstrates that the Proposal is not expected to have an impact on public health at the Yungngora and Jimbalakudunj Communities, nor on the associated pastoral station workers and Traditional Owners travelling on the land within the Development Envelope.

5 References

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Appendix A. Peer Review of Human Health Risk Assessment, Valhalla Gas Exploration and Appraisal Program

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TECHNICAL MEMORANDUM

Date: January 7, 2022

To: Samantha Richardson
Black Mountain Energy, Perth, WA

From: Travis Kline, MEM, BCES,
Geosyntec Consultants, Inc., Washington DC

David Reynolds, Ph.D., CEnvP (SC), Sydney, NSW

Subject: Peer Review of *Human Health Risk Assessment*, Valhalla Gas Exploration and Appraisal Program, Bennett Resources, December 14, 2021

1. INTRODUCTION

Overall, the document is well-organized and conforms to the recommendations and structure as outlined in *Health Risk Assessment (Scoping) Guidelines* (DoH 2010). These guidelines provide a framework for the health risk assessment component for the Environmental and Health Impact Assessment processes, and incorporate, by reference, Department of Health (DoH) and Ageing and enHealth Council (2002, 2012) environmental health risk assessment guidelines as well as DoH human health risk and hazard guidelines issues for Western Australia (DoH 2006).

2. Recommendations

a. **Surface Water Resources:** There is no discussion of surface water bodies (e.g., creeks, ponds) within the proposal area, although Section 2.1.1 lists swimming and fishing as relevant recreational activities in consideration of local communities. It is understood that there are no permanent water bodies within the development envelope, with Mt. Hardman Creek, a seasonal water body, the closest for consideration. Given that there is no vulnerable shallow aquifer in communication with even seasonal creeks, the predominant release mechanism associated with potential environmental exposure is the catastrophic failure and release of hydraulic fracturing fluid from container trucks or the lined retention ponds. The document could benefit from a discussion surrounding the low potential for surface water impacts and clarification of how flowback water will be managed on-site (e.g., impoundment construction, lining, secondary containment, if any). Surface water, as a receiving medium, should be added to Figure 2-2, if only to designate the absence of a complete exposure pathway under foreseeable future conditions.

b. **Constituents of Potential Concern (CoPCs):** The document could benefit from a discussion of the CoPCs at issue. Section 3, Health Risk Assessment, notes volatile

organic compounds (VOCs) and dust in ambient air and drilling fluids and HFS fluids in groundwater. Table 3-3 lists the potential presence of diesel range hydrocarbons, barium, cadmium, and chromium in soil, resulting from drilling fluids, but there is no discussion of surfactants, algicides, lubricants, etc., associated with hydraulic fracturing fluids. It is understood that indirect inhalation of off-gassing VOCs or dust by populations other than Valhalla Gas employees is likely to be very minimal, given the large ambient air mixing zone. Direct contact with soil, impacted by localized spills at well heads during development, by non-Valhalla Gas employees is not anticipated, except as a component of trespassing. The pastoral bores do not supply residential drinking water, but they do supply water for cattle and, as noted by Bennett, periodic ingestion by station workers or transients. I will defer to Valhalla in regard to specific CoPCs in light of the need to protect business confidential/proprietary mixtures, but in the absence of more detail with regard to type of chemical and anticipated concentration in environmental media, it is impossible to judge the accuracy or defensibility of generalized, qualitative assessment and elicited outcomes, such as "potentially temporary upset stomachs." In addition, Section 3.3 notes that some CoPCs could be associated with bioaccumulation. In light of cattle watering (Liveringa aquifer, low susceptibility from well development) and biotrophic transfer, the document could benefit from additional clarification. I am in agreement that there is low potential for chronic exposure (even if carcinogenic constituents are present) and very low potential for negative acute exposures; however, additional detail regarding specific CoPCs and anticipated ranges of environmental concentrations (perhaps in comparison to relevant health-based screening criteria) would significantly support the document as a defensible decision management tool and obviate the need for a detailed HHRA in the eyes of EPA and DoH.

c. **Soil to Groundwater Leaching:** There is limited to no discussion of surficial releases and their potential impact to groundwater. I am unsure of the depth to the Liveringa (or the screen depth of pastoral bores completed in the Liveringa), but if it is within 30 mbgs, leaching and transfer to groundwater (and anticipated dilution/attenuation) is worth mentioning. Figure 2-2 can be updated to show surface soil to subsurface soil to groundwater as a contributing pathway (unless the depth to the Liveringa is too extreme). It is also worth mentioning that surficial releases will attenuate with depth and that there are no anticipated complete exposure pathways associated with subsurface soil for populations other than Valhalla Gas workers. Figure 2-2 should also be updated to include incidental ingestion of soil in any complete exposure pathway identifying dermal contact with soil.

d. **Minor Clarifications:** The HHRA was not reviewed from a purely editorial perspective, although the following minor corrections are noted:
    i. **Section 3.1.1, Hazard:** VOCs should be defined as volatile organic compounds (not carbons).
    ii. **Section 3.1.1, Hazard:** The third bullet in this list should be revised to reflect: "VOCs and products of incomplete combustion (PICs) from flaring during well testing activities on site."
    iii. **Ramboll 2019.** Geosyntec did not conduct a thorough review of Ramboll 2019 but notes that this study reflects one specific operation. Geosyntec has not judged whether this operation is sufficiently similar in scope and nature to the Valhalla proposal, but is in general agreement that the low-level emissions associated with these activities will readily dissipate in the ambient air breathing zone, given the huge mixing zone available under proposed operations. Geosyntec does note that the only identified human health concern in the Ramboll 2019 study was predicated on dust and driven by background conditions (i.e., PM2.5, Caversham monitoring station), not specific to the study area.

3. SUMMARY & CONCLUSION

Overall, the study is very close to complete, is well ordered, easy to follow, and consistent with relevant administrative authority guidelines. Excepting additional discussion regarding the projected nature and extent of proposal CoPCs, and in recognition of the very low potential for exposure to populations outside Valhalla Gas workers, it is unlikely that a more detailed and comprehensive HHRA will be required.

Sincerely,

Travis Kline, MEM BCES
Senior Principal

David Reynolds
Senior Principal

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Department of Health and Ageing and enHealth Council (2002) *Environmental health risk assessment, Guidelines for assessing human health risks from environmental health hazards*. Canberra: Commonwealth of Australia.

Department of Health (2006) *Health Risk Assessment in Western Australia*. Perth: Department of Health.

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Appendix O. Valhalla Baseline Noise Monitoring Report

MEMO

Project:	Valhalla Gas Exploration and Appraisal Program – Baseline Noise Monitoring Survey	**Document No.:**	Mm 001 r01		
To:	Bennett Resources Pty Ltd	**Date:**	29 September 2021		
Attention:	Bennett Resources representatives	**Cross Reference:**	-		
Delivery:	Email	**Project No.:**	20210638		
From:	Ben Wilson	**No. Pages:**	17	**Attachments:**	Yes
Subject:	Baseline noise monitoring data				

The memo outlines the results of a baseline noise monitoring survey carried out for the proposed Valhalla Gas Exploration and Appraisal Program in the Kimberley region of Western Australia.

SURVEY DETAILS

Three noise loggers were deployed by Bennett Resources representatives from 16 – 23 August 2021. The loggers were deployed at sites being used concurrently for air quality monitoring.

The purpose of the survey was to establish existing background noise levels at representative locations around the project site.

Noise environment

Each logger was deployed at a remote rural/outback location. The noise environment was typically characterised by sounds from natural sources (bird song, insects, wind generated noise). It is understood vehicle use on nearby access roads is infrequent and not a dominant contributor to average noise levels.

A constant low-level noise was generated by the co-located air quality monitoring equipment which was only apparent at the quietest periods. The noise monitors were relocated midway through the survey to eliminate any influence of this noise (typically within 20-30 m of the original location).

Equipment details

Table 1 presents the detail of the noise logging equipment used for the survey. The location of each noise logger is also provided. Photos showing the loggers are presented in Appendix D. A map showing the location is provided in Appendix E.

A field calibration check was carried out. No significant change in level was noted for the survey period.

The loggers were configured to continuously measure noise levels at 125 ms intervals (post processed to generate 15-minute logging periods). Measurements were obtained using the slow ('S') response time and A-weighting frequency network for consistency with the *Western Australia Environmental Protection (Noise) Regulations 1997 (the Noise Regulations)* .

The logger microphones were mounted on tripods at a height of approximately 1.2m above ground level in free field conditions.

Weather conditions during the survey period were fine (no rain) and typical for the northern dry season, based on review of the BoM data from the Fitzroy Crossing weather station. Wind speeds during the survey were typically lowest during night-time periods with higher wind speeds during the middle of the day. Site specific conditions can be confirmed by AES.

Table 1: Noise monitoring equipment details

Logger/equipment	Device Type	Serial Number	Coordinates
Logger 1	01dB Cube (FW 2.50)	10423	17° 53' 55.05 S 124° 40' 08.52 E
Logger 2	01dB Cube (FW 2.50)	10418	18° 15' 44.57 S 124° 51' 46.22 E
Logger 3	01dB DUO (FW 2.50)	10447	18° 27' 48.49 S 124° 51' 27.67 E
Calibrator	Cal 21	34134143	n/a

RESULTS

Table 2 - Table 4 present the average levels for the day, evening and night periods for each logger. A range of typical measurement parameters have been presented.

A daily breakdown of the results is presented in Appendix B. Time history plots are provided in Appendix C

Table 2: Average noise level – Day time period (Day 0700-1900)

Logger	L_{Aeq}	L_{AS10}	L_{A90}	L_{ASmax}	L_{AS1}
Logger 1	44	42	34	56	48
Logger 2	46	52	43	44	42
Logger 3	46	44	32	55	51

Table 3: Average noise level – Evening period (1900-2200)

Logger	L_{Aeq}	L_{AS10}	L_{A90}	L_{ASmax}	L_{AS1}
Logger 1	40	42	31	50	45
Logger 2	52	51	46	57	53
Logger 3	48	48	43	52	50

Table 4: Average noise level – Night period (2200-0700)

Logger	L_{Aeq}	L_{AS10}	L_{A90}	L_{ASmax}	L_{AS1}
Logger 1	57	36	25	63	45
Logger 2	46	39	34	51	42
Logger 3	36	28	26	43	34

DISCUSSION

The results show levels that are consistent with remote locations not heavily influenced by human activity. Diurnal patterns typical of urban areas (higher average levels during the day and quieter at night) were not observed. Instead, noise levels were influenced by bird song and insects which are active during the early morning (dawn) and evening/early night periods. Detailed review of the L_{eq} levels for Logger 1 shows that they were likely to be heavily influenced by early morning bird song between 4-6am which may explain why the average night L_{eq} level is higher than the day and evening periods.

Brief periods of elevated levels (spikes in L_{Amax} levels) are likely due to vehicles passing or when birds and insects were located near the microphone (this was confirmed through sampling of audio from logger 3).

Of particular note is the very low levels of background noise at some periods during the night-time, particularly at logger location 3. Background levels (typically quantified using the L_{A90} parameter) fall below 20 dB for some periods at each location (see plots in Appendix C). This is at the quieter end of the range that might typically be expected in a remote location. Background noise at this level will not provide any masking so noise from any industrial or commercial sources could be more noticeable than might be the case in less remote areas with high background noise environments. This may be a relevant consideration during the assessment phase of the project, noting that the lower night-time assigned noise level is L_{A10} 35 dB.

APPENDIX A GLOSSARY OF TERMINOLOGY

Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa i.e. dB = 20 x log(P/Pr)
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
L_{A01}	The noise level exceeded for only 1% of the measurement period, measured in dBA. This is sometimes referred to as the typical maximum noise level.
L_{A10}	The noise level exceeded for 10% of the measurement period, measured in dBA. This is commonly referred to as the average maximum noise level.
$L_{A90\,(t)}$	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
$L_{Aeq\,(t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
Masking Noise	Background noise that is not disturbing, but due to its presence causes other unwanted noises to be less intelligible, noticeable and distracting.
Octave Band	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
SPL or L_P	Sound Pressure Level A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μPa RMS) and expressed in decibels.

APPENDIX B DETAILED RESULTS

Table 5 to Table 13 present the breakdown of average levels for each day. It should be noted that the results for the first day period (Monday 16 August) and last night period (Sunday 22 August) are based on partial periods since data was not collected for the entire period due to deployment and retrieval times.

Logger 1 results

Table 5: Logger 1 – Day time period (Day 0700-1900)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	44	46	40	61	50
Tuesday	47	45	36	59	52
Wednesday	46	42	29	55	49
Thursday	41	37	25	51	45
Friday	41	34	23	52	44
Saturday	39	35	24	50	44
Sunday	40	37	24	51	44
Average	**44**	**42**	**34**	**56**	**48**

Table 6: Logger 1 – Evening period (1900-2200)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	46	49	29	58	51
Tuesday	39	34	29	44	41
Wednesday	31	29	21	41	38
Thursday	35	36	30	45	42
Friday	34	35	29	41	39
Saturday	42	41	37	45	44
Sunday	39	35	31	39	37
Average	**40**	**42**	**31**	**50**	**45**

Table 7: Logger 1 – Night period (2200-0700)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	39	36	25	71	50
Tuesday	38	28	25	37	32
Wednesday	55	33	24	44	40
Thursday	58	39	23	53	48

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Friday	62	39	27	48	45
Saturday	54	32	23	42	38
Sunday	58	36	26	45	41
Average	57	36	25	63	45

Logger 2 results

Table 8: Logger 2 – Day time period (Day 0700-1900)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	44	61	50	46	40
Tuesday	29	28	28	35	30
Wednesday	44	36	29	43	40
Thursday	45	35	30	40	38
Friday	49	43	36	48	46
Saturday	47	42	38	44	43
Sunday	48	41	36	45	43
Average	**46**	**52**	**43**	**44**	**42**

Table 9: Logger 2 – Evening period (1900-2200)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	40	44	28	59	46
Tuesday	42	38	32	49	44
Wednesday	51	49	44	57	52
Thursday	54	52	48	57	54
Friday	55	53	49	58	55
Saturday	54	53	48	57	55
Sunday	54	52	48	56	54
Average	**52**	**51**	**46**	**57**	**53**

Table 10: Logger 2 – Night period (2200-0700)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	35	37	30	59	43
Tuesday	29	28	28	35	30
Wednesday	44	36	29	43	40
Thursday	45	35	30	40	38

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Friday	49	43	36	48	46
Saturday	47	42	38	44	43
Sunday	48	41	36	45	43
Average	**46**	**39**	**34**	**51**	**42**

Logger 3 results

Table 11: Logger 3 – Day time period (Day 0700-1900)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday *	-	-	-	-	-
Tuesday	52	51	38	61	57
Wednesday	49	45	33	56	51
Thursday	38	37	24	49	44
Friday	33	33	21	48	42
Saturday	30	30	20	44	38
Sunday	29	28	20	45	38
Average	**46**	**44**	**32**	**55**	**51**

* Insufficient data collected for analysis purposes as logger deployed late in day period.

Table 12: Logger 3 – Evening period (1900-2200)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	37	40	30	55	44
Tuesday	40	38	32	48	44
Wednesday	42	39	30	45	43
Thursday	48	49	44	53	51
Friday	50	50	46	52	51
Saturday	52	51	46	54	53
Sunday	50	49	44	53	52
Average	**48**	**48**	**43**	**52**	**50**

Table 13: Logger 3 – Night period (2200-0700)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	32	32	30	51	40
Tuesday	39	30	30	37	32
Wednesday	21	20	18	30	24

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Thursday	36	26	22	35	30
Friday	35	27	22	35	31
Saturday	37	29	23	36	33
Sunday	35	27	23	34	30
Average	**36**	**28**	**26**	**43**	**34**

APPENDIX C TIME HISTORY PLOTS

Figure 1: Logger 1 time history plot

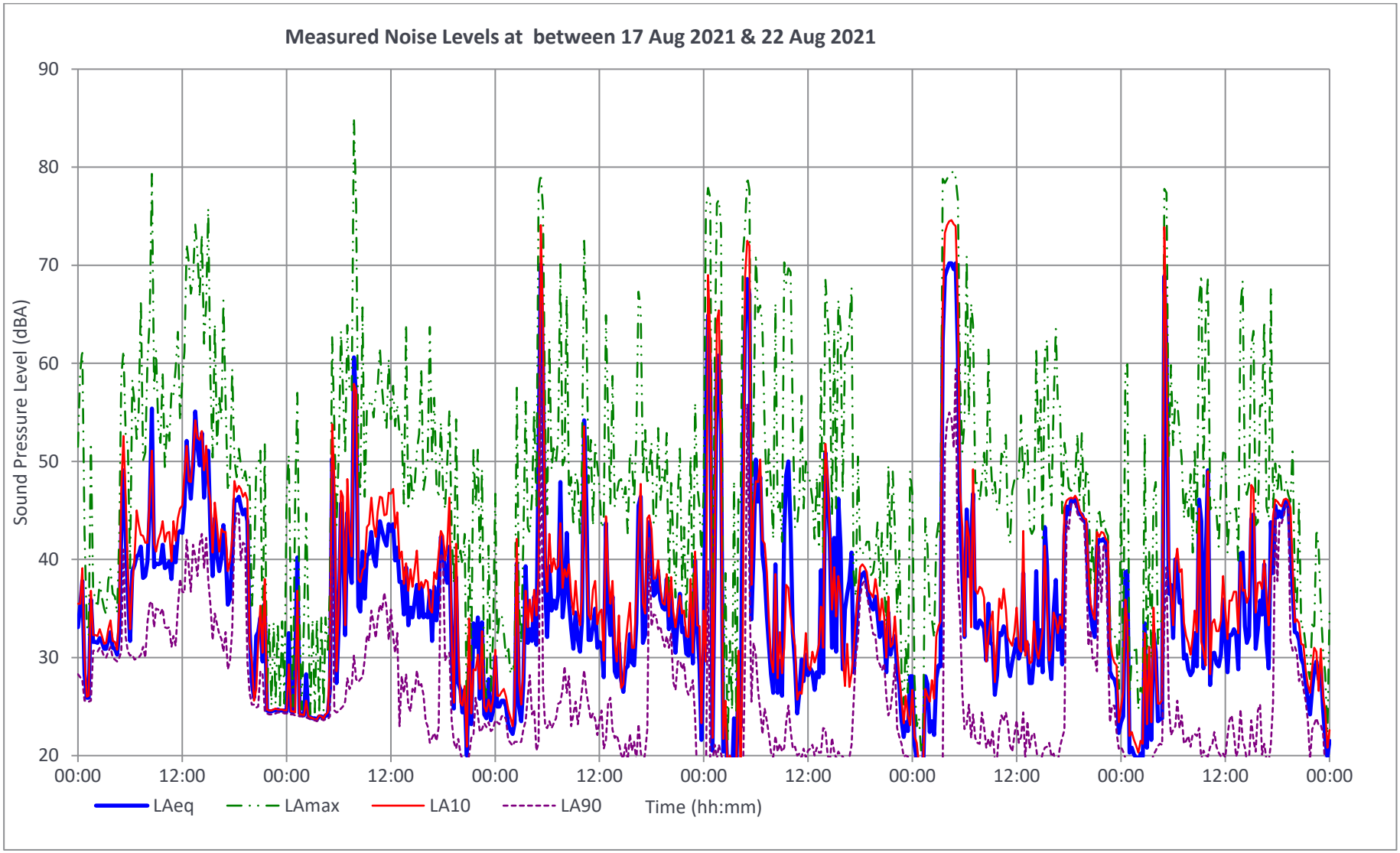


Figure 2: Logger 2 time history plot

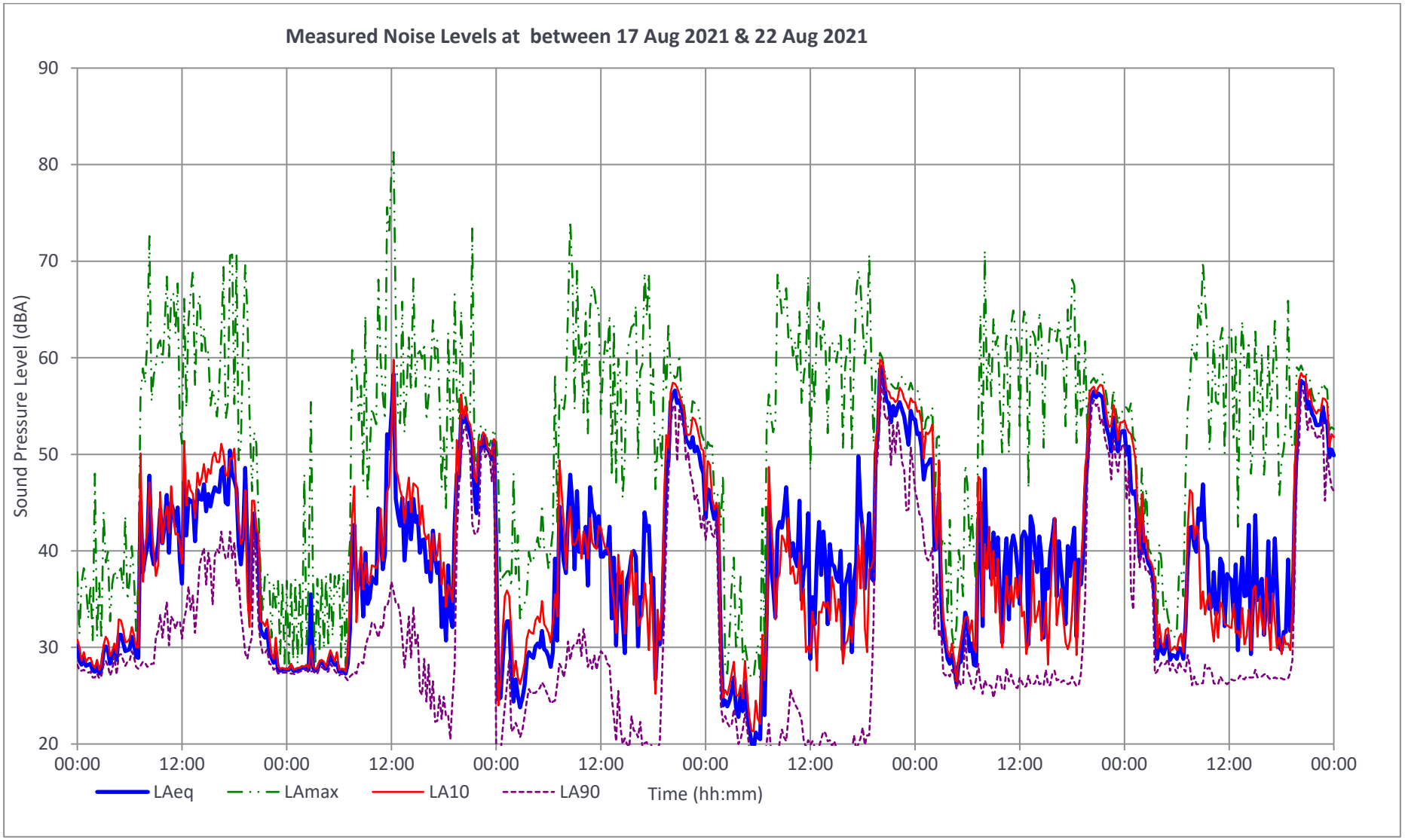
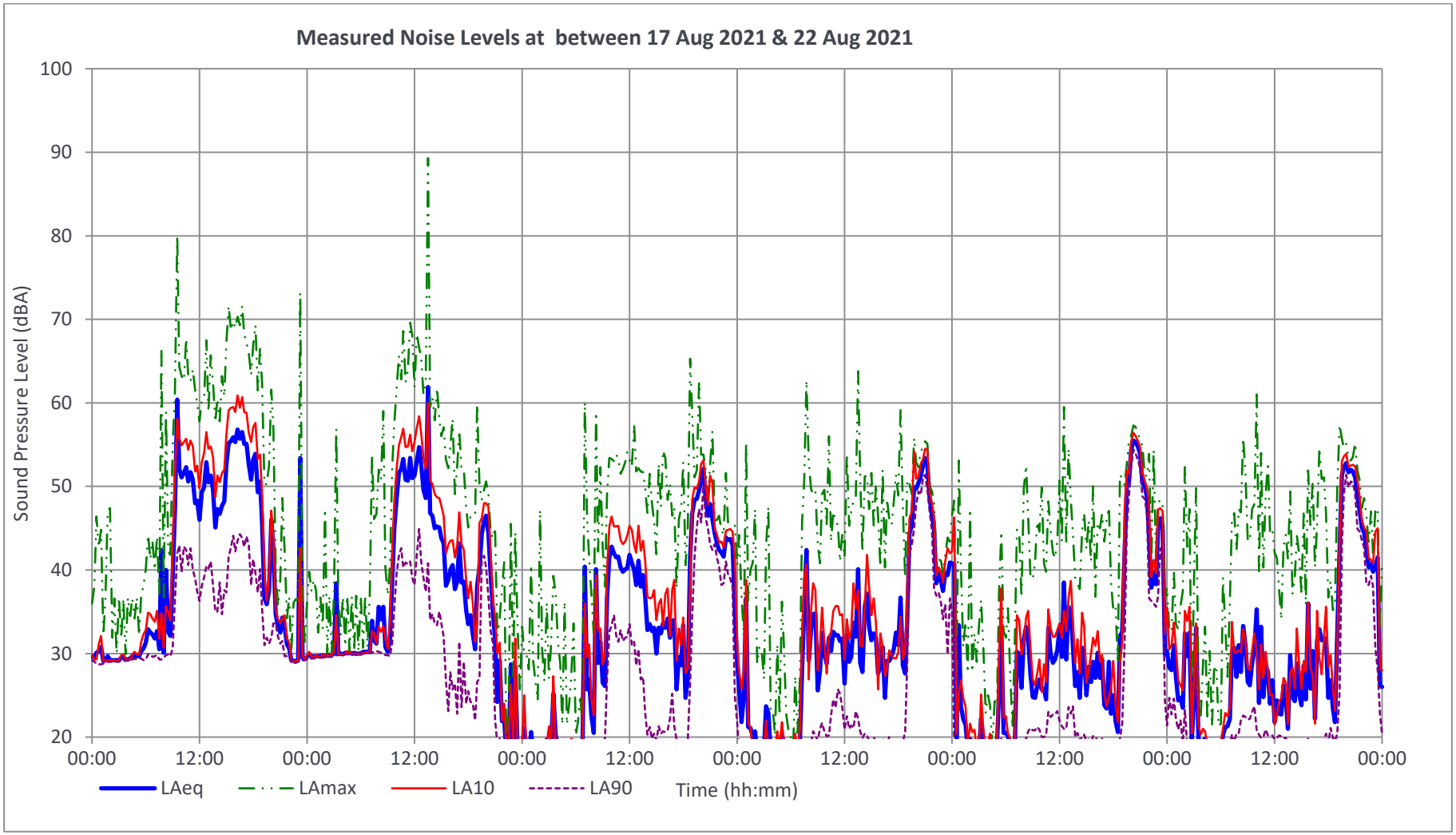


Figure 3: Logger 3 time history plot



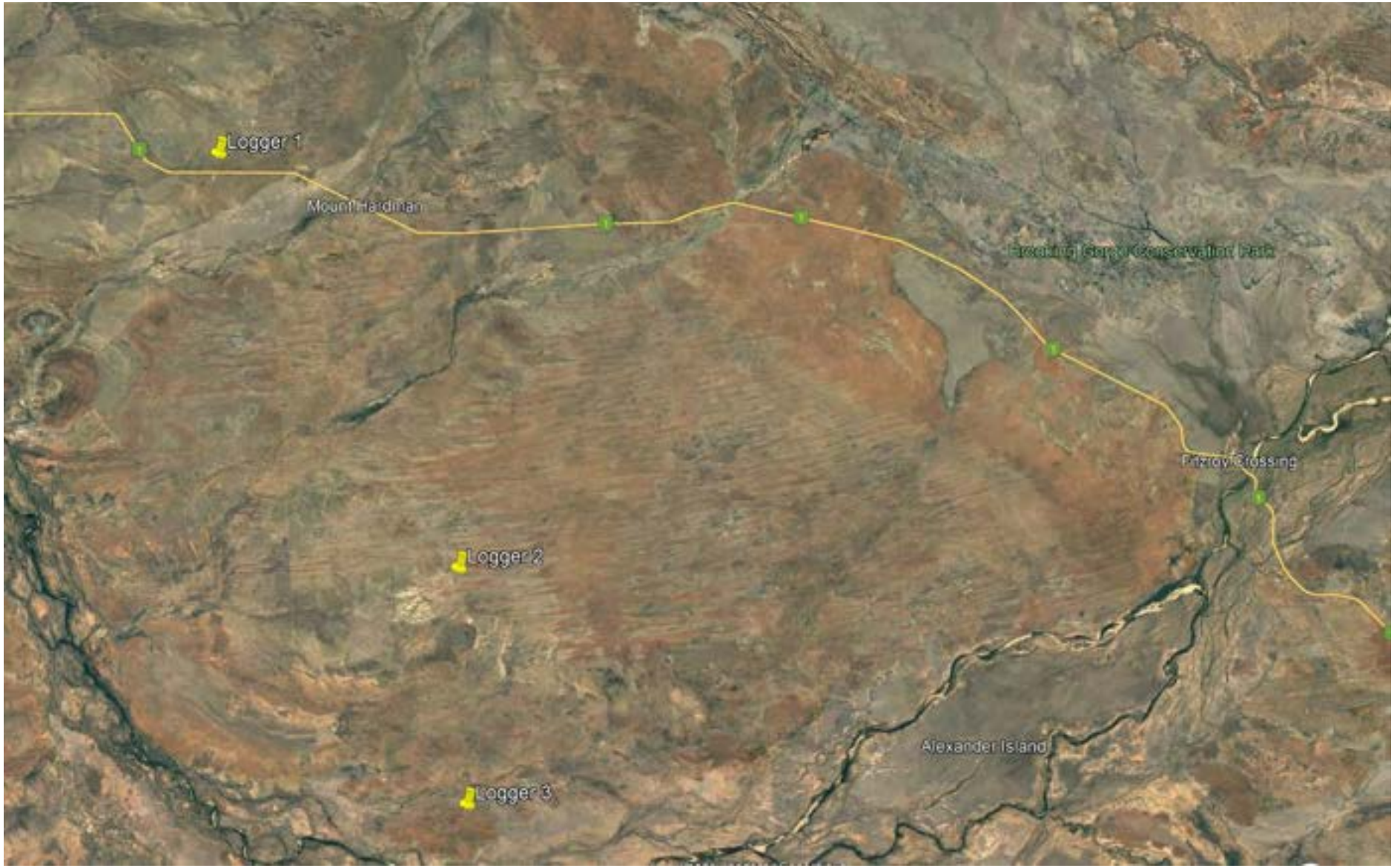
APPENDIX D LOGGER PHOTOS

Figure 4: : Logger 1 - Cube 10423

Figure 5: : Logger 2 - Cube 10418

Figure 6: : Logger 3 - Duo 10447

APPENDIX E AERIAL MAP SHOWING LOGGER LOCATIONS



Appendix P. Valhalla Noise Modelling Assessment

HERRING STORER ACOUSTICS

BENNETT RESOURCES PTY LTD

VALHALLA GAS EXPLORATION AND APPRAISAL PROGRAM

ENVIRONMENTAL ACOUSTIC IMPACT ASSESSMENT

NOVEMBER 2021

OUR REFERENCE: 28634-2-21370

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
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DOCUMENT CONTROL PAGE

ACOUSTIC ASSESSMENT

VALHALLA GAS EXPLORATION AND APPRAISAL PROGRAM

Job No: 21370

Document Reference: 28634-2-21370

FOR

BENNETT RESOURCES PTY LTD

DOCUMENT INFORMATION			
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APPENDICIES

1 Noise Contours

2 Ambient Noise Monitoring Data and Report

1. INTRODUCTION

Herring Storer Acoustics was commissioned by Bennett Resources Pty Ltd to undertake an acoustic assessment of noise emissions from the Valhalla Gas Exploration and Appraisal Program.

The Valhalla Gas Exploration and Appraisal Program is located approximately 51 km North West of the townsite of Fitzroy Crossing (Shire of Derby-West Kimberley) in the Canning Basin Region in the State of Western Australia. It is located within the Petroleum Lease EP 371.

Access to the Proposal area is via the Great Northern Highway and Calwynyardah-Noonkanbah Road from the township of Fitzroy Crossing.

The nearest noise sensitive premises are to the north and south of the Development Envelope of the Proposal, being the Jimbalakudunj and Yungnora Communities. Ten proposed well sites form part of the Proposal, with the closest wells being between 20 and 28km from the Communities.

The operations at each well site include the following activities:

Site preparation operations
- Civil activities including vegetation clearing and well site construction
- Construction of well site ponds, pits, sumps and well cellars

Drilling operations
- Mobilisation of drilling packaged, ancillary services, rig camp, personnel, and supplies
- Conducting drilling activities
- Wireline logging activities
- Well suspension

HFS operations
- Mobilisation of HFS spread personnel and supplies
- Well perforation and clean-up
- HFS treatment
- Well testing operations – use of flare pit
- Well suspension

This assessment takes into account the cumulative noise level of all activities at each of the proposed well sites. For information, Figure 1.1 shows the locations and overall map for the lease.

Operational hours for the site are proposed to be:

- Drilling operations will be 24 hours per day.
- HFS operations (including well testing) with pumps, blender and generators are the highest noise sources and will be running almost 24 hours per day.
- Site preparation operations will be conducted during daylight.

The estimated duration of HFS operations per well is about 10 days. Wells will be drilled and fracked one at a time.

As part of the study, the following was carried out:

- Identification of individual operations and the associated noise levels.
- Measure the ambient noise levels for the area prior to the commencement of works.
- Assess the predicted noise levels at the nearest surrounding noise sensitive premises for compliance with the appropriate criteria.
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

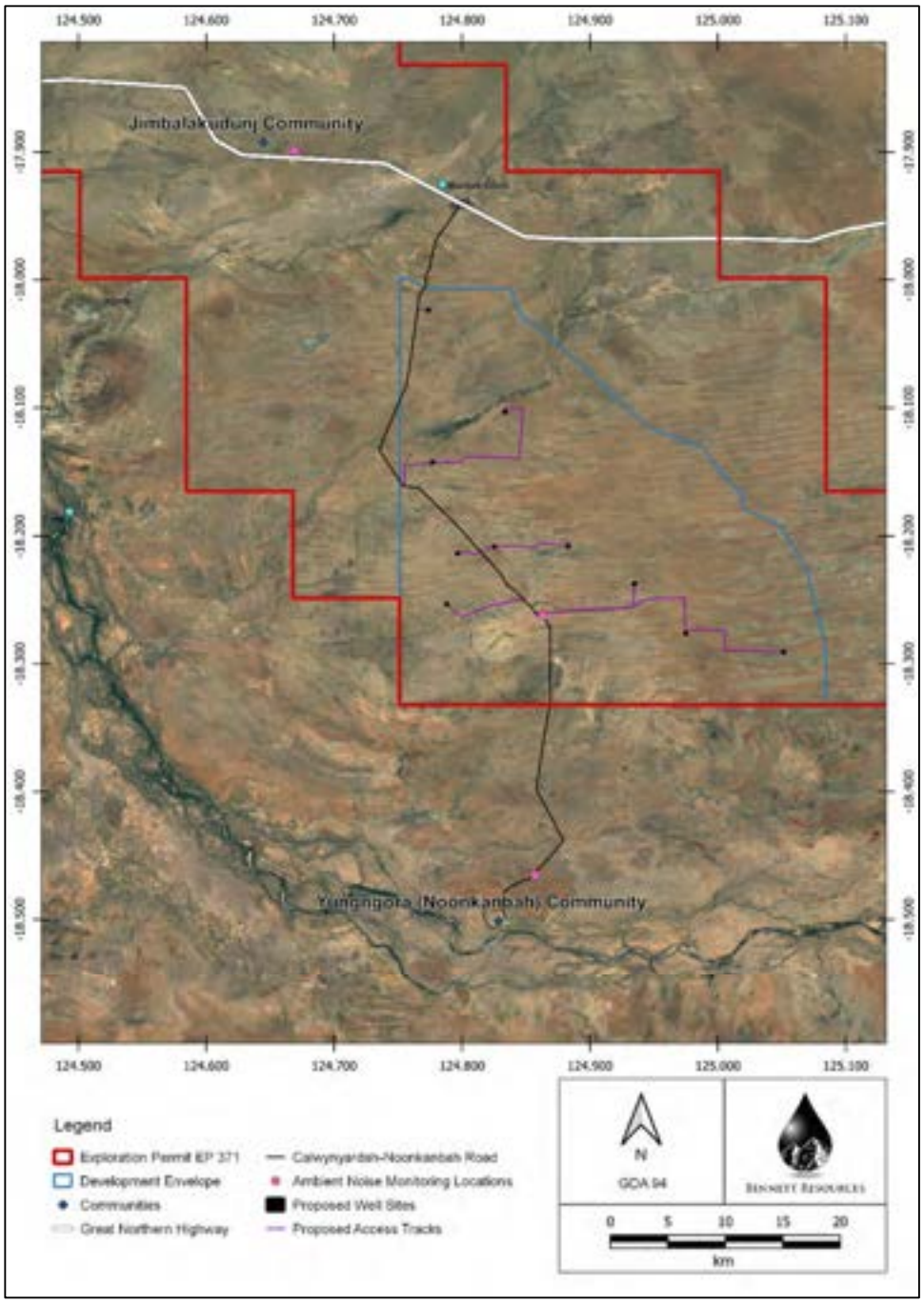


FIGURE 1.1 – SITE AND SURROUNDS

The assessment is provided to support the Environmental Review Document for the referral of the Proposal under Section 38 of the Environment Protection Act 1986.

2. SUMMARY

The assessment has been conducted on the proposed operation at the Valhalla Gas Exploration and Appraisal Program.

The nearest noise sensitive premises are to the north and south of the Development Envelope of the Proposal, being the Jimbalakudunj and Yungnora Communities. Ten proposed well sites form part of the Proposal, with the closest wells being between 20 and 28km from the Communities.

The applicable criterion for this assessment is an L_{A10} of 35 dB(A) at the nearest residential locations, (ie operations during night period).

Noise received at the existing residential premises has been determined, to be less than 10 dB(A) for the operations, for the worst-case operating scenario (i.e. operations at the nearest well to each receiver).

The above noise levels have been considered not to contain tonal characteristics, due to the low level of the noise emissions, (i.e. below background).

Given these operating parameters, noise levels received at the nearest premises has been calculated to comply with the *Environmental Protection (Noise) Regulations 1997* for the operating times as outlined in this assessment.

3. CRITERIA

The allowable noise level for noise sensitive premises in the vicinity of the proposed site is prescribed by the *Environmental Protection (Noise) Regulations 1997*. Regulations 7 and 8 stipulate maximum allowable external noise levels or assigned noise levels that can be received at a premise from another premises. For residential premises, this noise level is determined by the calculation of an influencing factor, which is then added to the base levels shown below. The influencing factor is calculated for the usage of land within two circles, having radii of 100m and 450m from the premises of concern. The base noise levels for residential premises are listed in Table 3.1.

TABLE 3.1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises	0700 - 1900 hours Monday to Saturday (Day)	45 + IF	55 + IF	65 + IF
	0900 - 1900 hours Sunday and Public Holidays (Sunday / Public Holiday Day Period)	40 + IF	50 + IF	65 + IF
	1900 - 2200 hours all days (Evening)	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays (Night)	35 + IF	45 + IF	55 + IF

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.
IF is the influencing factor.

It is a requirement that received noise be free of annoying characteristics (tonality, modulation and impulsiveness), defined below as per Regulation 9.

"impulsiveness" means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax\ Slow}$ is more than 15 dB when determined for a single representative event.

"modulation" means a variation in the emission of noise that –

(a) is more than 3dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;
(b) is present for more at least 10% of the representative assessment period; and
(c) is regular, cyclic and audible;

"tonality" means the presence in the noise emission of tonal characteristics where the difference between –

(a) the A-weighted sound pressure level in any one-third octave band; and
(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

The nearest potential noise sensitive premises to the proposed development have been identified using the area map in Figure 1.1. As there are no major roads or other areas of noise influence, the influencing factor is 0 with the assigned noise levels for operational times are as noted in Table 3.1.

4. MONITORED AMBIENT NOISE

As per the "Draft Guidelines on Environmental Noise for Prescribed Premises" (released in May 2016), continuous noise monitoring has been conducted to establish the ambient noise levels.

Continual ambient noise monitoring was conducted at three locations between the 16th and 23rd August 2021. Figure 4.1 contains a map of the monitoring location.

Appendix 2 contains the ambient noise monitoring data and report.

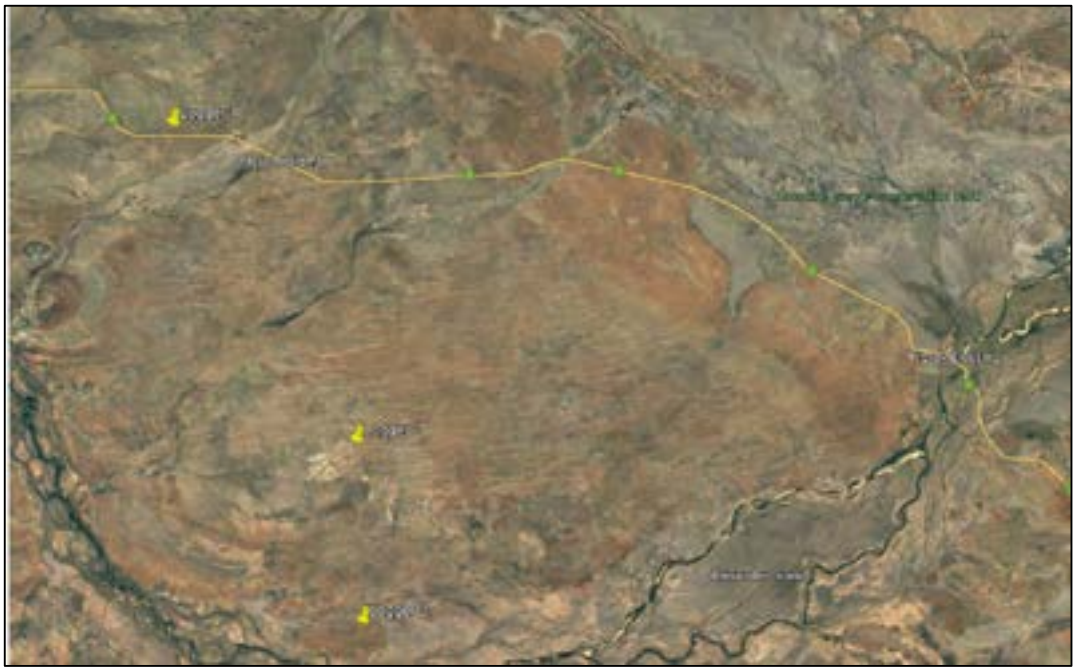


FIGURE 4.1 – NOISE MONITORING LOCATION MAP

5. CALCULATED NOISE LEVELS

Noise received at the nearest neighbouring residential premises, due to noise associated with the proposed operations, was modelled with the computer programme SoundPlan. Sound power levels used for the calculations are based on measured sound pressure levels of similar equipment proposed for use on site.

Given that the project is likely to commence in 4 years, the exact makes/models of equipment is unknown, as the project will be taking bids from multiple vendors.

The HFS spread will be comprised of high-pressure pumps, a blender (mixing unit to blend water, proppant, and chemicals), crane, generators, command centre and coil tubing unit (to clean out well post HFS and prior to well testing).

The modelling of noise levels has been based on noise sources and sound power levels shown in Table 5.1.

TABLE 5.1 – EQUIPMENT SOUND POWER LEVELS DB(A)

Equipment	Quantity	Typical make / model	Example engine type	SWL dB(A)
Frac pump	16	Halliburton Q10	Cat 3512E Tier IV Final 2500 BHP diesel	103
Blender	1	Halliburton FB4K	Cat C32 ACERT Tier IV Final 1225 BHP diesel	107
Wireline truck	1	Synergy 270	Detroit Diesel DD15 Tier IV Final 500 BHP diesel	110
Crane	1	Grove GMK5150	Mercedes OM471LA Tier IV Final 522 BHP diesel	110
Genset	1	Multiquip DCA-300SSCU	Cummins QSL9-G3 350 BHP diesel	108

Based on noise emissions[1] from the above equipment, an overall, worst case operating scenario has been developed. This scenario allows for all equipment to be operating at the same time, at each of the proposed well sites. It is noted that the operations will only be conducted at one well site at a time.

The design layout and site configuration, including source location is shown in Figure 5.1 and 5.2.

FIGURE 5.1 - Above photo is an actual layout from one of the wells completed by the previous operator of the permit within the same project area.

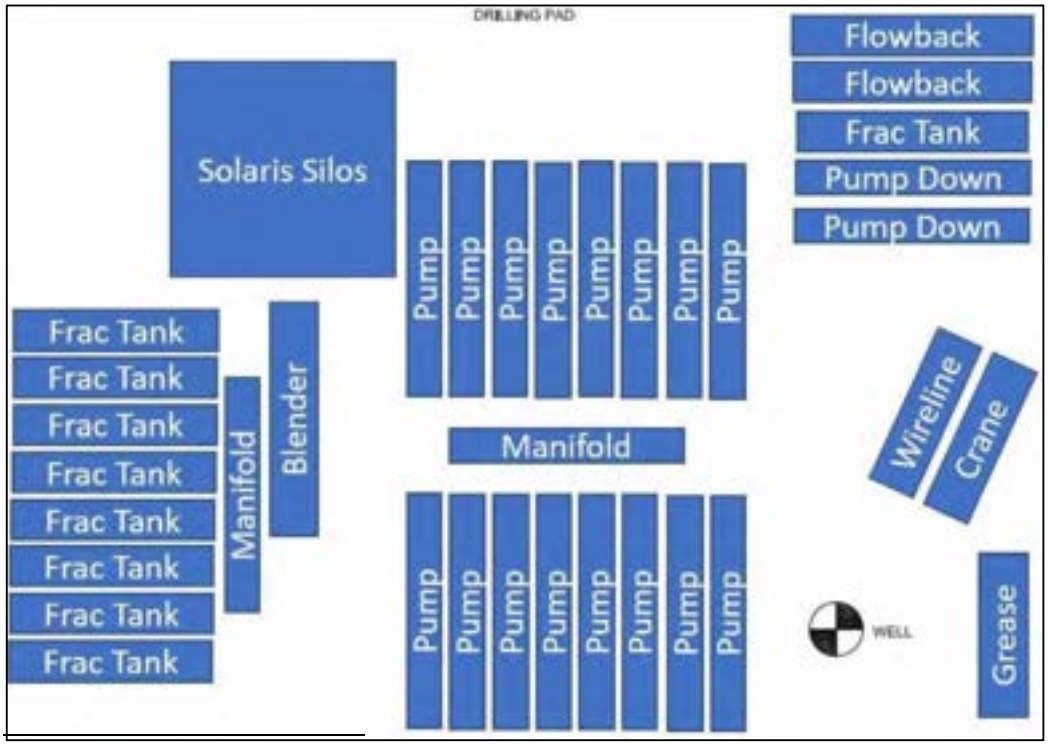


FIGURE 5.2- EXAMPLE OF SITE EQUIPMENT LAYOUT (NOISE SOURCE LOCATION)

The following input data was used in the calculations:

a) Provided plans.

b) Sound Power Levels listed in Table 5.1.

c) Ground contours and receiver point provided by client.

Weather conditions for modelling were as stipulated in the Environmental Protection Authority's "*Draft Guidance for Assessment of Environmental Factors No. 8 - Environmental Noise"* and for the day period are as listed in Table 4.

TABLE 4 – WEATHER CONDITIONS

Condition	Day	Night
Temperature	20°C	15°C
Relative humidity	50%	50%
Pasquill Stability Class	E	F
Wind speed	4 m/s*	3 m/s*

* From sources, towards receivers.

6. RESULTS

Calculated noise levels associated with the noise emissions from the proposed activities for the assumed scenario is summarised below in Table 6.1. Appendix B contains the noise contour plot with an example shown in Figure 6.1 below.

TABLE 6.1 – CALCULATED NOISE LEVEL

Receiver	All Equipment Operating dB(A)
Jimbalakudunj Community	< 10
Yungnora Community	< 10

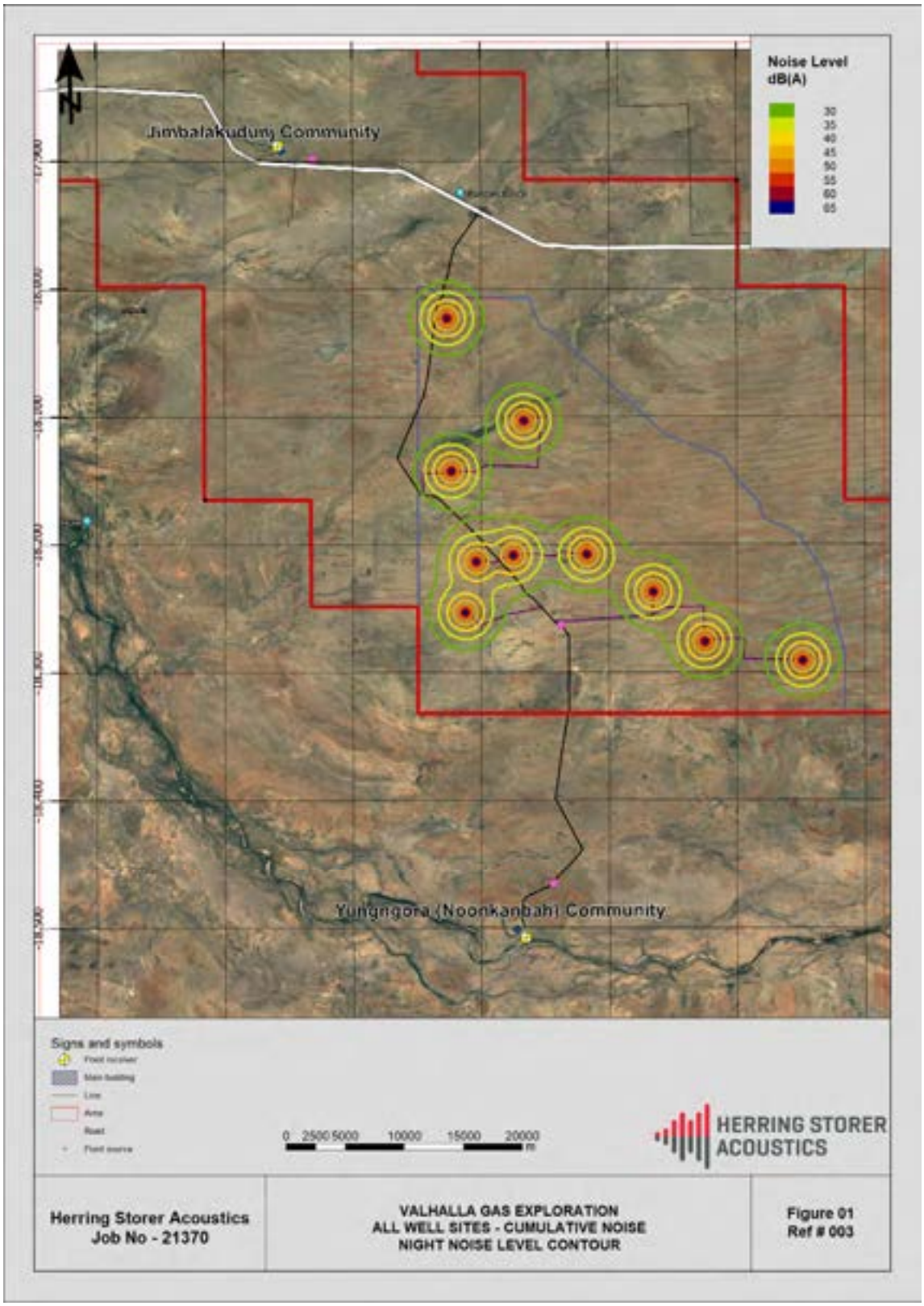


FIGURE 6.1- WORST CASE NOISE LEVEL CONTOUR PLT – ALL WELL SITES

7. ASSESSMENT

Based on calculated noise levels at the nearest premises, noise levels could be considered as not being tonal in characteristics. This is based on the calculated noise levels likely being less than the ambient noise levels.

Hence, Table 7.1 summarises the applicable Assigned Noise Levels, and assessable noise level emissions, for the scenario considered.

TABLE 7.1 – ASSESSMENT OF NOISE LEVELS

Receiver	All Equipment Operating	Time of Day	Assigned Level (dB)
Jimbalakudunj Community	< 10	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays (Night)	35
Yungnora Community	< 10		

The above noise levels all comply with the applicable L_{A10} assigned noise level of 35 dB(A) at the nearest residential locations.

8. CONCLUSION

Assessment has been conducted on the proposed operation at the Valhalla Gas Exploration and Appraisal Program.

The nearest noise sensitive premises are to the north and south of the Development Envelope of the Proposal, being the Jimbalakudunj and Yungnora Communities. Ten proposed well sites form part of the Proposal, with the closest wells being between 20 and 28km from the Communities.

The applicable criterion for this assessment is an L_{A10} of 35 dB(A) at the nearest residential locations, (ie operations during night period).

Noise received at the existing residential premises has been determined, to be less than 10 dB(A) for the operations, for the worst-case operating scenario (i.e. operations at the nearest well to each receiver).

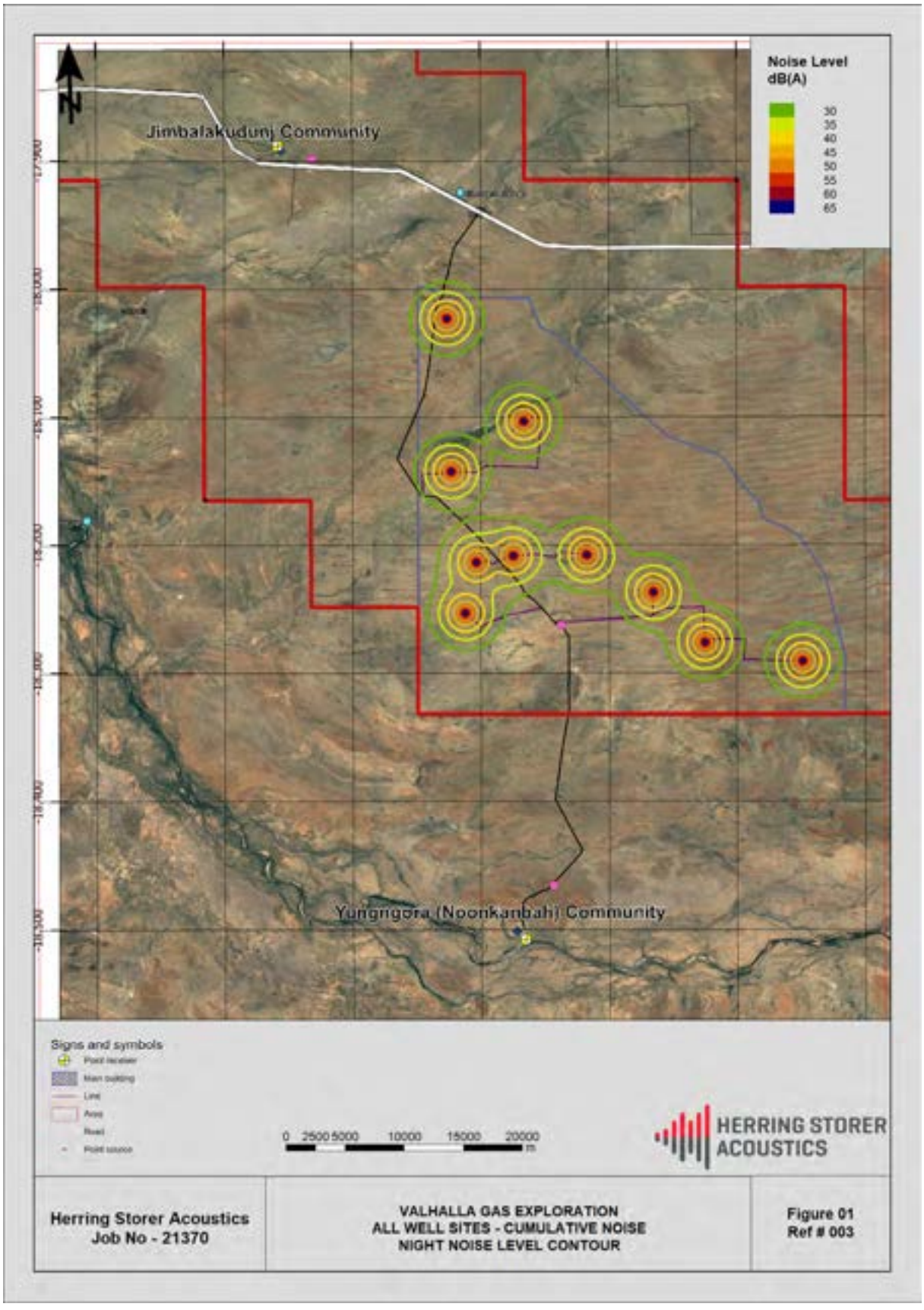
The above noise levels have been considered not to contain tonal characteristics, due to the low level of the noise emissions, (i.e. below background).

Given these operating parameters, noise levels received at the nearest premises has been calculated to comply with the *Environmental Protection (Noise) Regulations 1997* for the operating times as outlined in this assessment.

APPENDIX 1

Noise Contours

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
P.O. Box 219, Como, W.A. 6952
(08) 9367 6200
hsa@hsacoustics.com.au


Noise Level
dB(A)
30
35
40
45
50
55
60
65
Jimbalakudunj Community
Yungngora (Noonkanbah) Community
Signs and symbols
0 2500 5000 10000 15000 20000
m
HERRING STORER
ACOUSTICS
Herring Storer Acoustics
Job No - 21370
VALHALLA GAS EXPLORATION
ALL WELL SITES - CUMULATIVE NOISE
NIGHT NOISE LEVEL CONTOUR
Figure 01
Ref # 003

APPENDIX 2

Ambient Noise Monitoring Data and Report

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
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MEMO

Project:	Valhalla Gas Exploration and Appraisal Program – Baseline Noise Monitoring Survey	**Document No.:**	Mm 001 r01		
To:	Bennett Resources Pty Ltd	**Date:**	29 September 2021		
Attention:	Bennett Resources representatives	**Cross Reference:**	-		
Delivery:	Email	**Project No.:**	20210638		
From:	Ben Wilson	**No. Pages:**	17	**Attachments:**	Yes
Subject:	Baseline noise monitoring data				

The memo outlines the results of a baseline noise monitoring survey carried out for the proposed Valhalla Gas Exploration and Appraisal Program in the Kimberley region of Western Australia.

SURVEY DETAILS

Three noise loggers were deployed by Bennett Resources representatives from 16 – 23 August 2021. The loggers were deployed at sites being used concurrently for air quality monitoring.

The purpose of the survey was to establish existing background noise levels at representative locations around the project site.

Noise environment

Each logger was deployed at a remote rural/outback location. The noise environment was typically characterised by sounds from natural sources (bird song, insects, wind generated noise). It is understood vehicle use on nearby access roads is infrequent and not a dominant contributor to average noise levels.

A constant low-level noise was generated by the co-located air quality monitoring equipment which was only apparent at the quietest periods. The noise monitors were relocated midway through the survey to eliminate any influence of this noise (typically within 20-30 m of the original location).

Equipment details

Table 1 presents the detail of the noise logging equipment used for the survey. The location of each noise logger is also provided. Photos showing the loggers are presented in Appendix D. A map showing the location is provided in Appendix E.

A field calibration check was carried out. No significant change in level was noted for the survey period.

The loggers were configured to continuously measure noise levels at 125 ms intervals (post processed to generate 15-minute logging periods). Measurements were obtained using the slow ('S') response time and A-weighting frequency network for consistency with the *Western Australia Environmental Protection (Noise) Regulations 1997 (the Noise Regulations)* .

The logger microphones were mounted on tripods at a height of approximately 1.2m above ground level in free field conditions.

Weather conditions during the survey period were fine (no rain) and typical for the northern dry season, based on review of the BoM data from the Fitzroy Crossing weather station. Wind speeds during the survey were typically lowest during night-time periods with higher wind speeds during the middle of the day. Site specific conditions can be confirmed by AES.

Table 1: Noise monitoring equipment details

Logger/equipment	Device Type	Serial Number	Coordinates
Logger 1	01dB Cube (FW 2.50)	10423	17° 53' 55.05 S 124° 40' 08.52 E
Logger 2	01dB Cube (FW 2.50)	10418	18° 15' 44.57 S 124° 51' 46.22 E
Logger 3	01dB DUO (FW 2.50)	10447	18° 27' 48.49 S 124° 51' 27.67 E
Calibrator	Cal 21	34134143	n/a

RESULTS

Table 2 - Table 4 present the average levels for the day, evening and night periods for each logger. A range of typical measurement parameters have been presented.

A daily breakdown of the results is presented in Appendix B. Time history plots are provided in Appendix C

Table 2: Average noise level – Day time period (Day 0700-1900)

Logger	L_{Aeq}	L_{AS10}	L_{A90}	L_{ASmax}	L_{AS1}
Logger 1	44	42	34	56	48
Logger 2	46	52	43	44	42
Logger 3	46	44	32	55	51

Table 3: Average noise level – Evening period (1900-2200)

Logger	L_{Aeq}	L_{AS10}	L_{A90}	L_{ASmax}	L_{AS1}
Logger 1	40	42	31	50	45
Logger 2	52	51	46	57	53
Logger 3	48	48	43	52	50

Table 4: Average noise level – Night period (2200-0700)

Logger	L_{Aeq}	L_{AS10}	L_{A90}	L_{ASmax}	L_{AS1}
Logger 1	57	36	25	63	45
Logger 2	46	39	34	51	42
Logger 3	36	28	26	43	34

DISCUSSION

The results show levels that are consistent with remote locations not heavily influenced by human activity. Diurnal patterns typical of urban areas (higher average levels during the day and quieter at night) were not observed. Instead, noise levels were influenced by bird song and insects which are active during the early morning (dawn) and evening/early night periods. Detailed review of the L_{eq} levels for Logger 1 shows that they were likely to be heavily influenced by early morning bird song between 4-6am which may explain why the average night L_{eq} level is higher than the day and evening periods.

Brief periods of elevated levels (spikes in L_{Amax} levels) are likely due to vehicles passing or when birds and insects were located near the microphone (this was confirmed through sampling of audio from logger 3).

Of particular note is the very low levels of background noise at some periods during the night-time, particularly at logger location 3. Background levels (typically quantified using the L_{A90} parameter) fall below 20 dB for some periods at each location (see plots in Appendix C). This is at the quieter end of the range that might typically be expected in a remote location. Background noise at this level will not provide any masking so noise from any industrial or commercial sources could be more noticeable than might be the case in less remote areas with high background noise environments. This may be a relevant consideration during the assessment phase of the project, noting that the lower night-time assigned noise level is L_{A10} 35 dB.

APPENDIX A GLOSSARY OF TERMINOLOGY

Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa i.e. dB = 20 x log(P/Pr)
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
L_{A01}	The noise level exceeded for only 1% of the measurement period, measured in dBA. This is sometimes referred to as the typical maximum noise level.
L_{A10}	The noise level exceeded for 10% of the measurement period, measured in dBA. This is commonly referred to as the average maximum noise level.
$L_{A90\,(t)}$	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
$L_{Aeq\,(t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
Masking Noise	Background noise that is not disturbing, but due to its presence causes other unwanted noises to be less intelligible, noticeable and distracting.
Octave Band	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
SPL or L_P	Sound Pressure Level A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μPa RMS) and expressed in decibels.

APPENDIX B DETAILED RESULTS

Table 5 to Table 13 present the breakdown of average levels for each day. It should be noted that the results for the first day period (Monday 16 August) and last night period (Sunday 22 August) are based on partial periods since data was not collected for the entire period due to deployment and retrieval times.

Logger 1 results

Table 5: Logger 1 – Day time period (Day 0700-1900)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	44	46	40	61	50
Tuesday	47	45	36	59	52
Wednesday	46	42	29	55	49
Thursday	41	37	25	51	45
Friday	41	34	23	52	44
Saturday	39	35	24	50	44
Sunday	40	37	24	51	44
Average	**44**	**42**	**34**	**56**	**48**

Table 6: Logger 1 – Evening period (1900-2200)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	46	49	29	58	51
Tuesday	39	34	29	44	41
Wednesday	31	29	21	41	38
Thursday	35	36	30	45	42
Friday	34	35	29	41	39
Saturday	42	41	37	45	44
Sunday	39	35	31	39	37
Average	**40**	**42**	**31**	**50**	**45**

Table 7: Logger 1 – Night period (2200-0700)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	39	36	25	71	50
Tuesday	38	28	25	37	32
Wednesday	55	33	24	44	40
Thursday	58	39	23	53	48

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Friday	62	39	27	48	45
Saturday	54	32	23	42	38
Sunday	58	36	26	45	41
Average	57	36	25	63	45

Logger 2 results

Table 8: Logger 2 – Day time period (Day 0700-1900)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	44	61	50	46	40
Tuesday	29	28	28	35	30
Wednesday	44	36	29	43	40
Thursday	45	35	30	40	38
Friday	49	43	36	48	46
Saturday	47	42	38	44	43
Sunday	48	41	36	45	43
Average	**46**	**52**	**43**	**44**	**42**

Table 9: Logger 2 – Evening period (1900-2200)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	40	44	28	59	46
Tuesday	42	38	32	49	44
Wednesday	51	49	44	57	52
Thursday	54	52	48	57	54
Friday	55	53	49	58	55
Saturday	54	53	48	57	55
Sunday	54	52	48	56	54
Average	**52**	**51**	**46**	**57**	**53**

Table 10: Logger 2 – Night period (2200-0700)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	35	37	30	59	43
Tuesday	29	28	28	35	30
Wednesday	44	36	29	43	40
Thursday	45	35	30	40	38

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Friday	49	43	36	48	46
Saturday	47	42	38	44	43
Sunday	48	41	36	45	43
Average	**46**	**39**	**34**	**51**	**42**

Logger 3 results

Table 11: Logger 3 – Day time period (Day 0700-1900)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday *	-	-	-	-	-
Tuesday	52	51	38	61	57
Wednesday	49	45	33	56	51
Thursday	38	37	24	49	44
Friday	33	33	21	48	42
Saturday	30	30	20	44	38
Sunday	29	28	20	45	38
Average	**46**	**44**	**32**	**55**	**51**

* Insufficient data collected for analysis purposes as logger deployed late in day period.

Table 12: Logger 3 – Evening period (1900-2200)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	37	40	30	55	44
Tuesday	40	38	32	48	44
Wednesday	42	39	30	45	43
Thursday	48	49	44	53	51
Friday	50	50	46	52	51
Saturday	52	51	46	54	53
Sunday	50	49	44	53	52
Average	**48**	**48**	**43**	**52**	**50**

Table 13: Logger 3 – Night period (2200-0700)

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Monday	32	32	30	51	40
Tuesday	39	30	30	37	32
Wednesday	21	20	18	30	24

Day of week	Noise level (dB)				
160821-220821	**L_{Aeq}**	**L_{AS10}**	**L_{A90}**	**L_{ASmax}**	**L_{AS1}**
Thursday	36	26	22	35	30
Friday	35	27	22	35	31
Saturday	37	29	23	36	33
Sunday	35	27	23	34	30
Average	**36**	**28**	**26**	**43**	**34**

APPENDIX C TIME HISTORY PLOTS

Figure 1: Logger 1 time history plot

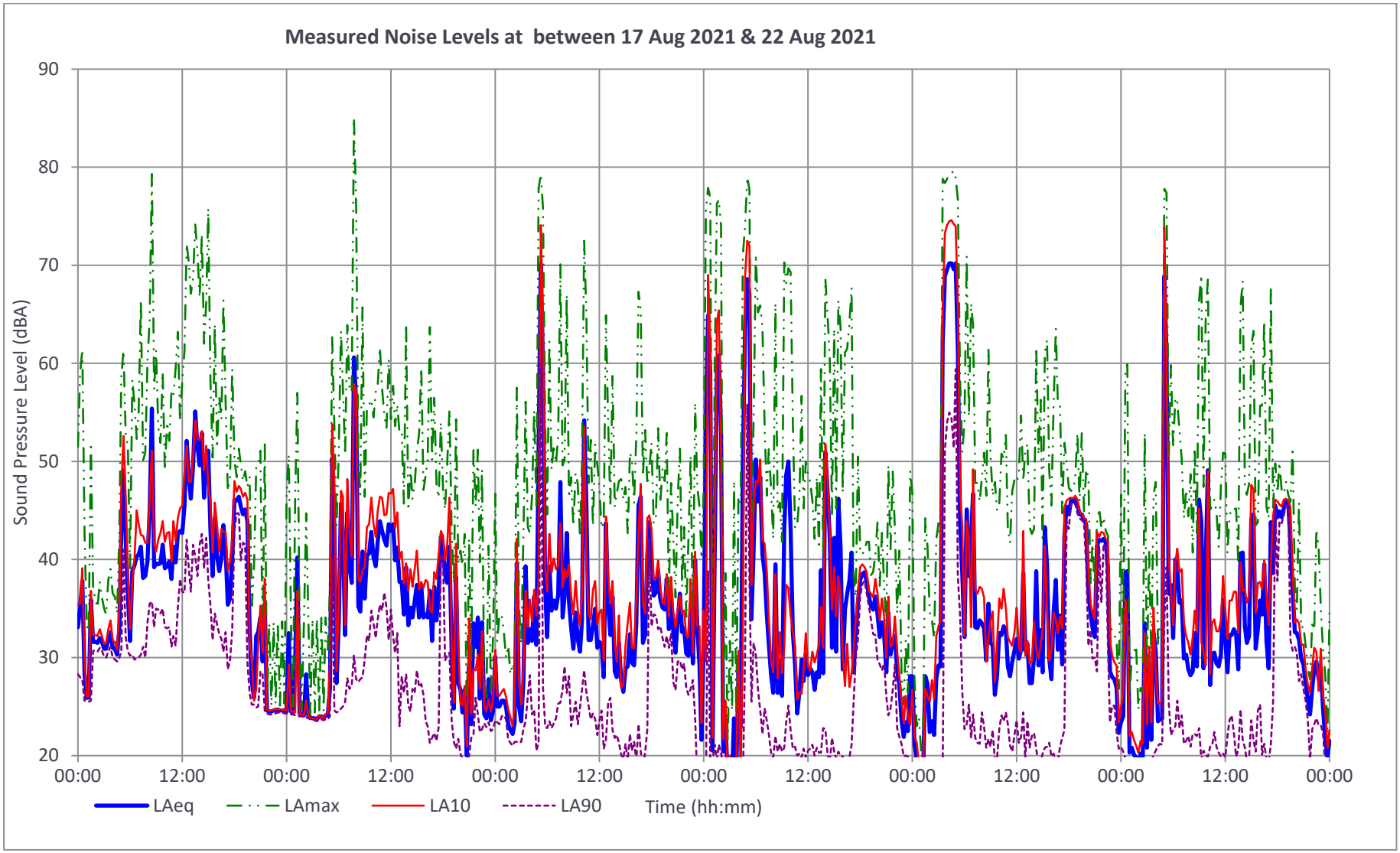


Figure 2: Logger 2 time history plot

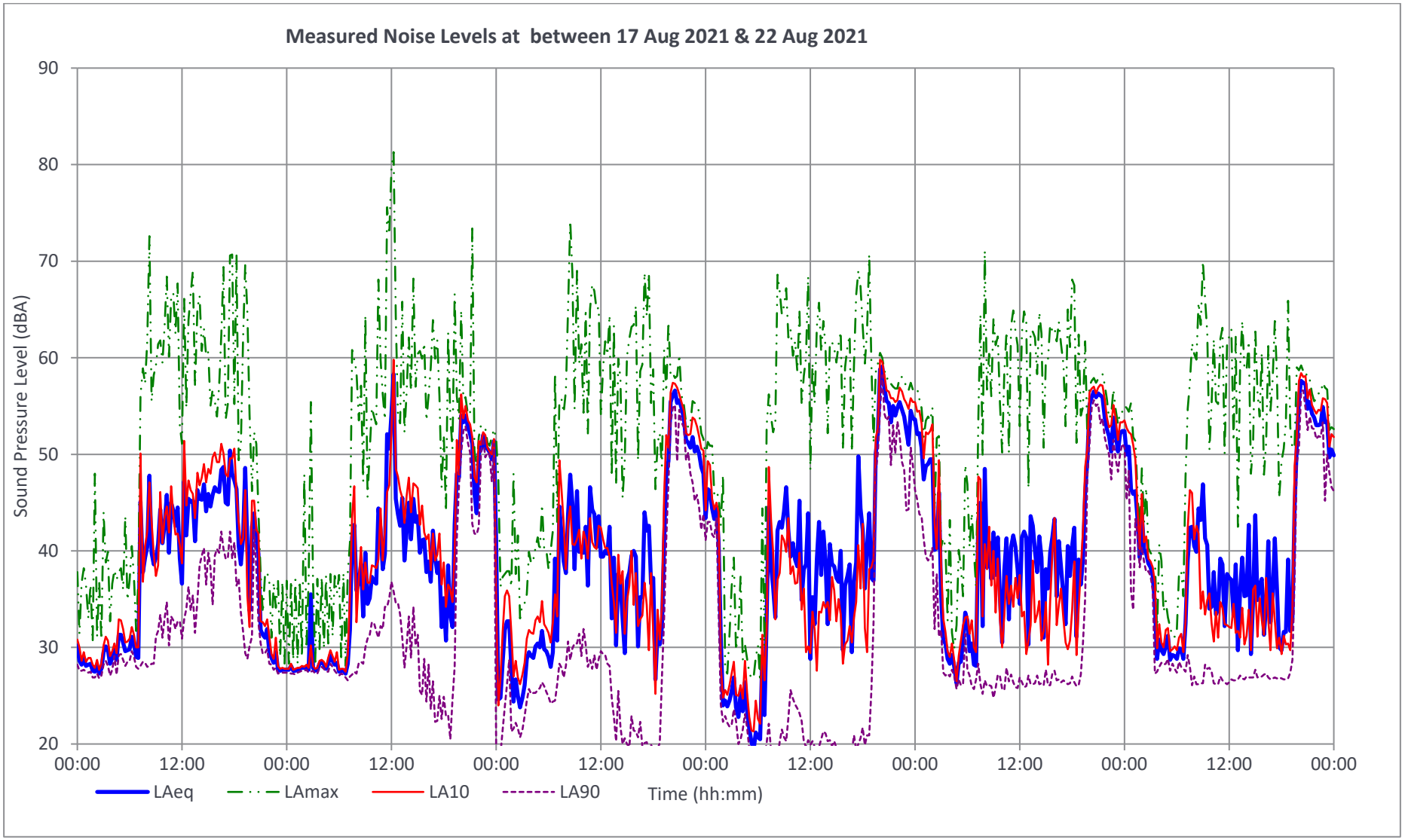
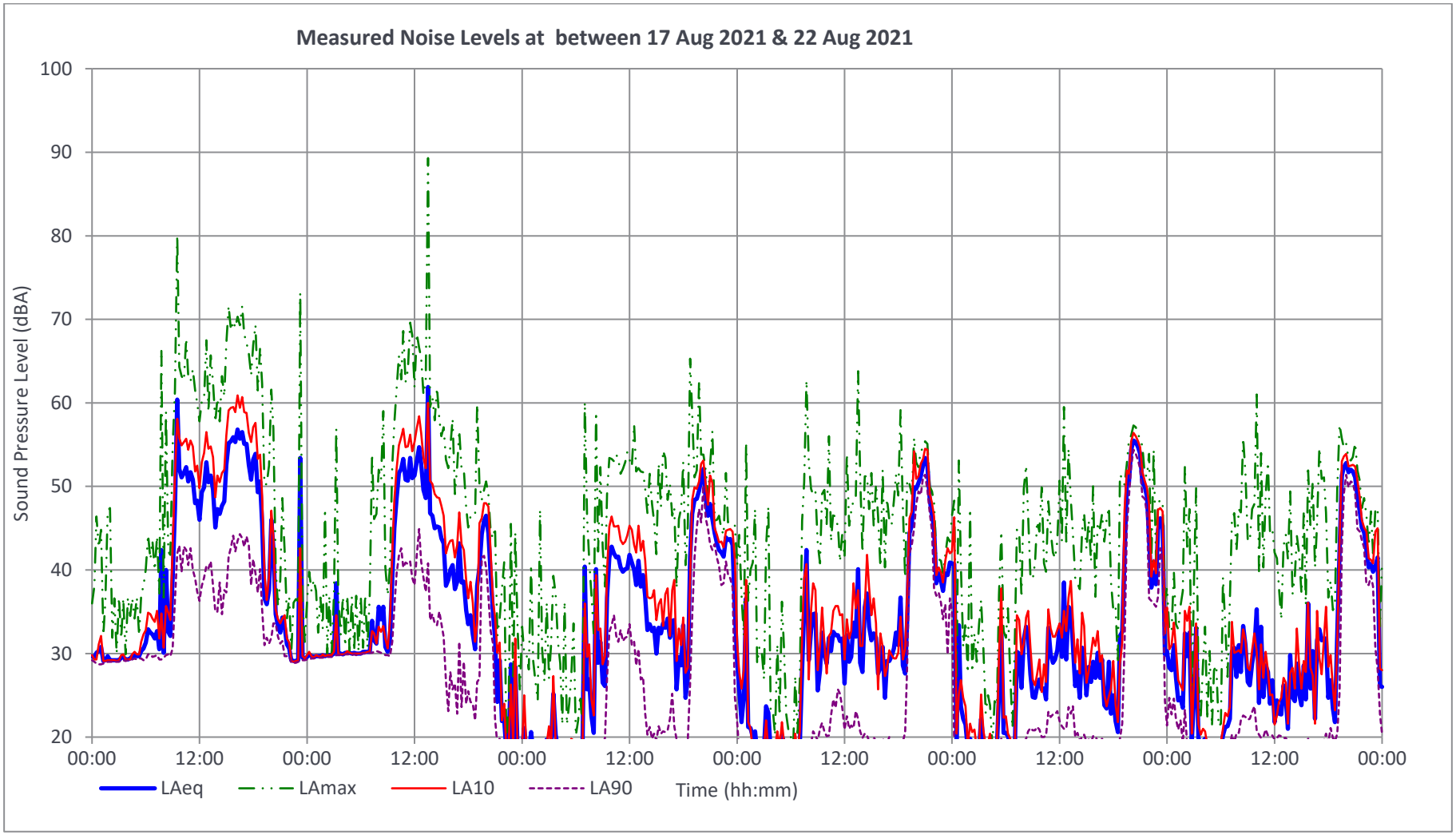


Figure 3: Logger 3 time history plot



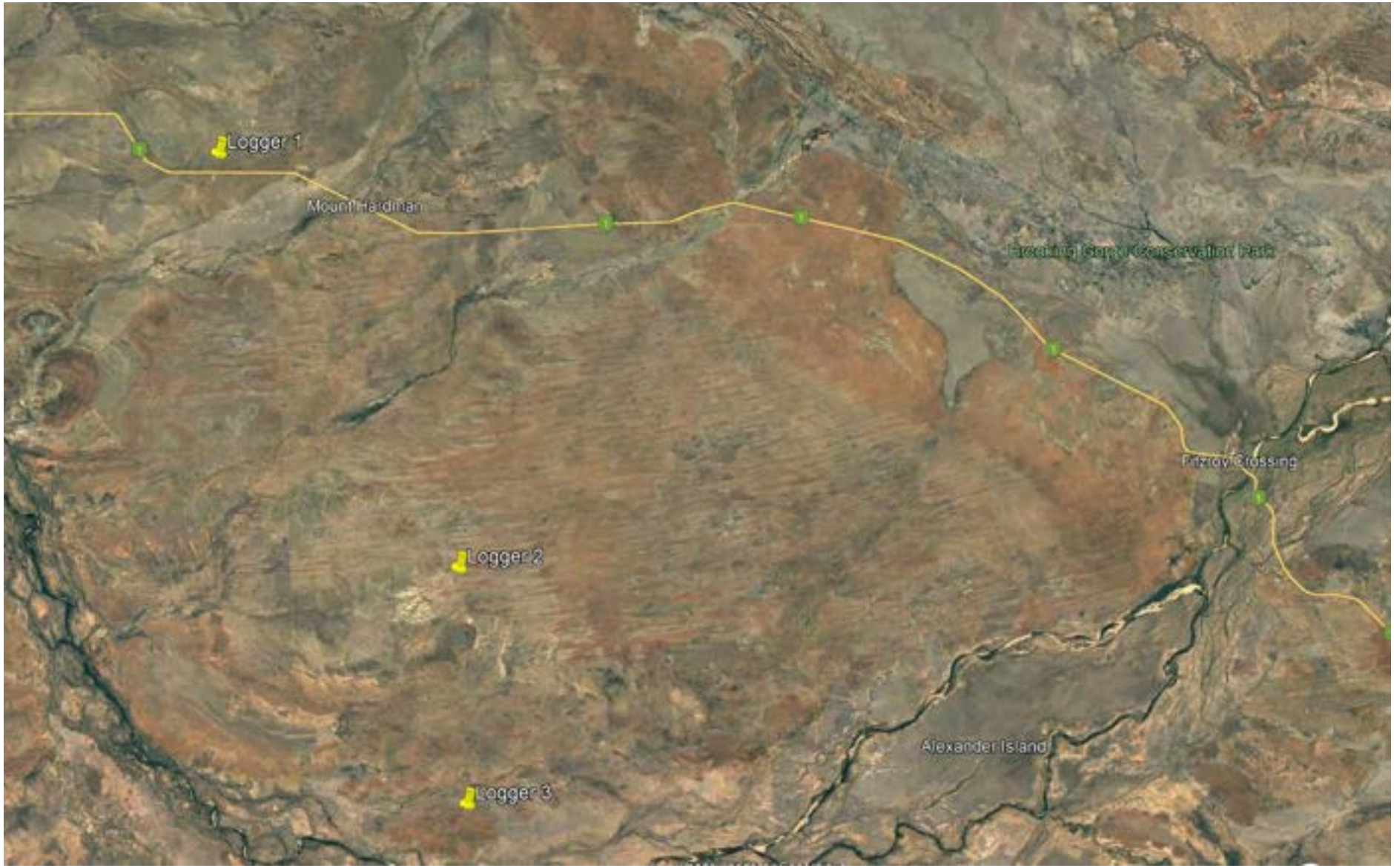
APPENDIX D LOGGER PHOTOS

Figure 4: : Logger 1 - Cube 10423

Figure 5: : Logger 2 - Cube 10418

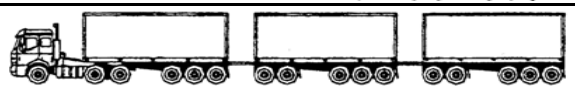
Figure 6: : Logger 3 - Duo 10447

APPENDIX E AERIAL MAP SHOWING LOGGER LOCATIONS



Appendix Q. Baseline Traffic Monitoring Data

AUSTROADS Vehicle Classification System

Level 1	Level 2		Level 3	AUSTROADS Classification		
Length (indicative)	**Axles and Axle Groups**		**Vehicle Type**			
Type	**Axles**	**Groups**	**Typical Description**	**Class**	**Parameters**	**Typical Configuration**
	LIGHT VEHICLES					
Short up to 5.5m		1 or 2	**Short** Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc	**1**	d(1) ≤ 3.2m and axles = 2	
Medium 5.5m to 14.5m	3, 4 or 5	3	**Short - Towing** Trailer, Caravan, Boat, etc	**2**	groups = 3 d(1) ≥ 2.1m, d(1) ≤ 3.2m, d(2) ≥ 2.1m and axles = 3, 4 or 5	
	HEAVY VEHICLES					
	2	2	**Two Axle Truck or Bus**	**3**	d(1) > 3.2m and axles = 2	
	3	2	**Three Axle Truck or Bus**	**4**	axles = 3 and groups = 2	
	> 3	2	**Four Axle Truck**	**5**	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	**Three Axle Articulated** Three axle articulated vehicle, or Rigid vehicle and trailer	**6**	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	**Four Axle Articulated** Four axle articulated vehicle, or Rigid vehicle and trailer	**7**	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	**Five Axle Articulated** Five axle articulated vehicle, or Rigid vehicle and trailer	**8**	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	≥ 6	> 2	**Six Axle Articulated** Six axle articulated vehicle, or Rigid vehicle and trailer	**9**	axles = 6 and groups > 2 or axles > 6 and groups = 3	
Medium Combination 17.5m to 36.5m	> 6	4	**B Double** B Double, or Heavy truck and trailer	**10**	groups = 4 and axles > 6	
	> 6	5 or 6	**Double Road Train** Double road train, or Medium articulated vehicle and one dog trailer (M.A.D.)	**11**	groups = 5 or 6 and axles > 6	
Large Combination Over 33.0m	> 6	> 6	**Triple Road Train** Triple road train, or Heavy truck and three trailers	**12**	groups > 6 and axles > 6	

Definitions:

Group: Axle group, where adjacent axles are less than 2.1m apart

Groups: Number of axle groups

Axles: Number of axles (maximum axle spacing of 10.0m)

d(1): Distance between first and second axle

d(2): Distance between second and third axle

MetroCount Traffic Executive
Daily Classes

DailyClass-6 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 1239 / 1245 (99.52%)

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 19 July 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed	19	0	1	0	0	0	0	0	0	0	0	3	23
(%)	82.6	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	
Thu	40	0	1	0	0	0	0	0	3	0	0	2	46
(%)	87.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	6.5	0.0	0.0	4.3	
Fri	31	2	4	0	0	0	0	0	1	0	0	2	40
(%)	77.5	5.0	10.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	5.0	
Sat	26	0	4	0	0	0	0	0	0	0	0	0	30
(%)	86.7	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	16	0	3	0	0	0	0	1	0	0	0	0	20
(%)	80.0	0.0	15.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week	22	0	2	0	0	0	0	0	1	0	0	1	27
(%)	83.0	1.3	8.2	0.0	0.0	0.0	0.0	0.6	2.5	0.0	0.0	4.4	
Weekdays	23	1	2	0	0	0	0	0	1	0	0	2	27
(%)	82.6	1.8	5.5	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0	6.4	
Weekend	21	0	4	0	0	0	0	1	0	0	0	0	25
(%)	84.0	0.0	14.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 26 July 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	23	0	2	1	0	0	0	0	1	0	0	0	27
(%)	85.2	0.0	7.4	3.7	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.0	
Tue	18	0	0	0	0	0	0	0	2	0	0	0	20
(%)	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	
Wed	27	0	0	1	0	0	0	0	0	0	0	0	28
(%)	96.4	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu	37	5	2	0	0	0	0	0	2	0	0	0	46
(%)	80.4	10.9	4.3	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	
Fri	35	2	1	0	0	0	0	0	0	0	0	3	41
(%)	85.4	4.9	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	
Sat	40	0	4	0	0	0	0	0	0	0	0	2	46
(%)	87.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	
Sun	21	2	0	0	0	0	0	0	1	0	0	0	24
(%)	87.5	8.3	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0	

Average daily volume

Entire week													
	29	1	1	0	0	0	0	0	1	0	0	1	33
(%)	86.6	3.9	3.9	0.9	0.0	0.0	0.0	0.0	2.6	0.0	0.0	2.2	
Weekdays													
	28	1	1	0	0	0	0	0	1	0	0	1	32
(%)	86.4	4.3	3.1	1.2	0.0	0.0	0.0	0.0	3.1	0.0	0.0	1.9	
Weekend													
	31	1	2	0	0	0	0	0	1	0	0	1	35
(%)	87.1	2.9	5.7	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	2.9	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 2 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	25	3	0	0	0	0	0	0	0	0	0	0	28
(%)	89.3	10.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	21	2	2	0	0	0	0	0	0	0	1	0	26
(%)	80.8	7.7	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	
Wed	42	6	3	3	0	0	1	0	0	1	0	3	59
(%)	71.2	10.2	5.1	5.1	0.0	0.0	1.7	0.0	0.0	1.7	0.0	5.1	
Thu	31	2	8	5	0	0	1	1	2	0	0	4	54
(%)	57.4	3.7	14.8	9.3	0.0	0.0	1.9	1.9	3.7	0.0	0.0	7.4	
Fri	56	1	2	0	0	0	0	0	1	0	0	0	60
(%)	93.3	1.7	3.3	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	
Sat	31	1	3	1	0	0	0	1	1	0	0	1	39
(%)	79.5	2.6	7.7	2.6	0.0	0.0	0.0	2.6	2.6	0.0	0.0	2.6	
Sun	25	4	0	0	0	0	0	1	0	0	0	1	31
(%)	80.6	12.9	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	3.2	

Average daily volume

Entire week	33	3	3	1	0	0	0	0	1	0	0	1	42
(%)	77.8	6.4	6.1	3.0	0.0	0.0	0.7	1.0	1.3	0.3	0.3	3.0	
Weekdays	35	3	3	2	0	0	0	0	1	0	0	1	45
(%)	77.1	6.2	6.6	3.5	0.0	0.0	0.9	0.4	1.3	0.4	0.4	3.1	
Weekend	28	3	2	1	0	0	0	1	1	0	0	1	35
(%)	80.0	7.1	4.3	1.4	0.0	0.0	0.0	2.9	1.4	0.0	0.0	2.9	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 9 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	35	0	0	2	0	0	0	0	0	0	0	1	38
(%)	92.1	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	
Tue	20	1	4	0	0	0	1	0	0	0	0	3	29
(%)	69.0	3.4	13.8	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	10.3	
Wed	29	2	2	0	0	0	0	0	0	0	1	6	40
(%)	72.5	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	15.0	
Thu	31	3	3	0	0	0	0	0	2	1	2	4	46
(%)	67.4	6.5	6.5	0.0	0.0	0.0	0.0	0.0	4.3	2.2	4.3	8.7	
Fri	28	0	0	0	0	0	0	0	2	0	0	0	30
(%)	93.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0	0.0	0.0	
Sat	37	1	4	0	0	0	1	0	0	0	0	0	43
(%)	86.0	2.3	9.3	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	
Sun	24	2	0	0	0	0	0	0	2	0	0	0	28
(%)	85.7	7.1	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	

Average daily volume

Entire week													
	29	1	2	0	0	0	0	0	1	0	0	2	36
(%)	80.3	3.5	5.1	0.8	0.0	0.0	0.8	0.0	2.4	0.4	1.2	5.5	
Weekdays													
	29	1	2	0	0	0	0	0	1	0	1	3	37
(%)	78.1	3.3	4.9	1.1	0.0	0.0	0.5	0.0	2.2	0.5	1.6	7.7	
Weekend													
	31	2	2	0	0	0	1	0	1	0	0	0	36
(%)	85.9	4.2	5.6	0.0	0.0	0.0	1.4	0.0	2.8	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 16 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	34	5	3	1	0	1	1	0	0	0	0	0	45
(%)	75.6	11.1	6.7	2.2	0.0	2.2	2.2	0.0	0.0	0.0	0.0	0.0	
Tue	33	6	0	1	0	0	0	0	0	0	0	2	42
(%)	78.6	14.3	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	
Wed	21	0	1	0	2	0	0	0	0	0	0	2	26
(%)	80.8	0.0	3.8	0.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	7.7	
Thu	42	3	2	0	0	1	0	1	2	0	0	0	51
(%)	82.4	5.9	3.9	0.0	0.0	2.0	0.0	2.0	3.9	0.0	0.0	0.0	
Fri	43	4	5	0	0	0	0	0	0	0	0	0	52
(%)	82.7	7.7	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat	30	1	2	2	0	0	0	0	0	0	0	0	35
(%)	85.7	2.9	5.7	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	14	0	0	0	0	0	0	0	0	0	0	0	14
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week	31	3	2	1	0	0	0	0	0	0	0	1	38
(%)	81.9	7.2	4.9	1.5	0.8	0.8	0.4	0.4	0.8	0.0	0.0	1.5	
Weekdays	35	4	2	0	0	0	0	0	0	0	0	1	43
(%)	80.1	8.3	5.1	0.9	0.9	0.9	0.5	0.5	0.9	0.0	0.0	1.9	
Weekend	22	1	1	1	0	0	0	0	0	0	0	0	25
(%)	89.8	2.0	4.1	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 23 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	29	1	0	0	0	0	0	0	0	0	0	0	30
(%)	96.7	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	2	0	0	0	0	0	0	0	0	0	0	0	2
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Fri*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week

	16	1	0	0	0	0	0	0	0	0	0	0	16
(%)	96.9	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Weekdays

	16	1	0	0	0	0	0	0	0	0	0	0	16
(%)	96.9	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Weekend No complete days.

*** - Incomplete**

MetroCount Traffic Executive
Daily Classes

DailyClass-6 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 620 / 1245 (49.80%)

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 19 July 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed	9	0	1	0	0	0	0	0	0	0	0	0	10
(%)	90.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu	22	0	1	0	0	0	0	0	1	0	0	2	26
(%)	84.6	0.0	3.8	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	7.7	
Fri	13	1	2	0	0	0	0	0	1	0	0	1	18
(%)	72.2	5.6	11.1	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0	5.6	
Sat	14	0	2	0	0	0	0	0	0	0	0	0	16
(%)	87.5	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	8	0	2	0	0	0	0	1	0	0	0	0	11
(%)	72.7	0.0	18.2	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	

Average daily volume

Entire week	11	0	1	0	0	0	0	0	0	0	0	1	14
(%)	81.5	1.2	9.9	0.0	0.0	0.0	0.0	1.2	2.5	0.0	0.0	3.7	
Weekdays	11	0	1	0	0	0	0	0	1	0	0	1	14
(%)	81.5	1.9	7.4	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0	5.6	
Weekend	11	0	2	0	0	0	0	1	0	0	0	0	14
(%)	81.5	0.0	14.8	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 26 July 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	9	0	1	0	0	0	0	0	0	0	0	0	10
(%)	90.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	10	0	0	0	0	0	0	0	1	0	0	0	11
(%)	90.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	
Wed	16	0	0	1	0	0	0	0	0	0	0	0	17
(%)	94.1	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu	24	0	1	0	0	0	0	0	1	0	0	0	26
(%)	92.3	0.0	3.8	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	
Fri	16	1	0	0	0	0	0	0	0	0	0	0	17
(%)	94.1	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat	18	0	3	0	0	0	0	0	0	0	0	2	23
(%)	78.3	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	
Sun	10	1	0	0	0	0	0	0	0	0	0	0	11
(%)	90.9	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week													
	15	0	1	0	0	0	0	0	0	0	0	0	16
(%)	89.6	1.7	4.3	0.9	0.0	0.0	0.0	0.0	1.7	0.0	0.0	1.7	
Weekdays													
	15	0	0	0	0	0	0	0	0	0	0	0	16
(%)	92.6	1.2	2.5	1.2	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	
Weekend													
	14	1	2	0	0	0	0	0	0	0	0	1	17
(%)	82.4	2.9	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 2 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	10	2	0	0	0	0	0	0	0	0	0	0	12
(%)	83.3	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	11	0	1	0	0	0	0	0	0	0	0	0	12
(%)	91.7	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed	21	4	0	2	0	0	0	0	0	1	0	0	28
(%)	75.0	14.3	0.0	7.1	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	
Thu	12	0	5	2	0	0	1	1	1	0	0	4	26
(%)	46.2	0.0	19.2	7.7	0.0	0.0	3.8	3.8	3.8	0.0	0.0	15.4	
Fri	31	0	1	0	0	0	0	0	0	0	0	0	32
(%)	96.9	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat	16	1	2	1	0	0	0	0	1	0	0	0	21
(%)	76.2	4.8	9.5	4.8	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	
Sun	10	4	0	0	0	0	0	1	0	0	0	1	16
(%)	62.5	25.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0	6.3	

Average daily volume

Entire week													
	16	2	1	1	0	0	0	0	0	0	0	1	21
(%)	75.5	7.5	6.1	3.4	0.0	0.0	0.7	1.4	1.4	0.7	0.0	3.4	
Weekdays													
	17	1	1	1	0	0	0	0	0	0	0	1	22
(%)	77.3	5.5	6.4	3.6	0.0	0.0	0.9	0.9	0.9	0.9	0.0	3.6	
Weekend													
	13	3	1	1	0	0	0	1	1	0	0	1	19
(%)	70.3	13.5	5.4	2.7	0.0	0.0	0.0	2.7	2.7	0.0	0.0	2.7	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 9 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	20	0	0	0	0	0	0	0	0	0	0	0	20
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	10	0	2	0	0	0	0	0	0	0	0	1	13
(%)	76.9	0.0	15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	
Wed	14	1	1	0	0	0	0	0	0	0	0	3	19
(%)	73.7	5.3	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	
Thu	15	1	3	0	0	0	0	0	1	0	2	3	25
(%)	60.0	4.0	12.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	8.0	12.0	
Fri	19	0	0	0	0	0	0	0	1	0	0	0	20
(%)	95.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	
Sat	15	1	2	0	0	0	0	0	0	0	0	0	18
(%)	83.3	5.6	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	11	0	0	0	0	0	0	0	1	0	0	0	12
(%)	91.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	

Average daily volume

Entire week													
	15	0	1	0	0	0	0	0	0	0	0	1	18
(%)	81.9	2.4	6.3	0.0	0.0	0.0	0.0	0.0	2.4	0.0	1.6	5.5	
Weekdays													
	16	0	1	0	0	0	0	0	0	0	0	1	19
(%)	80.4	2.1	6.2	0.0	0.0	0.0	0.0	0.0	2.1	0.0	2.1	7.2	
Weekend													
	13	1	1	0	0	0	0	0	1	0	0	0	15
(%)	86.7	3.3	6.7	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 16 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	16	2	1	1	0	1	1	0	0	0	0	0	22
(%)	72.7	9.1	4.5	4.5	0.0	4.5	4.5	0.0	0.0	0.0	0.0	0.0	
Tue	15	3	0	1	0	0	0	0	0	0	0	0	19
(%)	78.9	15.8	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed	11	0	1	0	1	0	0	0	0	0	0	2	15
(%)	73.3	0.0	6.7	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	13.3	
Thu	24	2	1	0	0	1	0	1	1	0	0	0	30
(%)	80.0	6.7	3.3	0.0	0.0	3.3	0.0	3.3	3.3	0.0	0.0	0.0	
Fri	24	3	3	0	0	0	0	0	0	0	0	0	30
(%)	80.0	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat	13	0	1	1	0	0	0	0	0	0	0	0	15
(%)	86.7	0.0	6.7	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	5	0	0	0	0	0	0	0	0	0	0	0	5
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week	15	1	1	0	0	0	0	0	0	0	0	0	19
(%)	79.4	7.4	5.1	2.2	0.7	1.5	0.7	0.7	0.7	0.0	0.0	1.5	
Weekdays	18	2	1	0	0	0	0	0	0	0	0	0	23
(%)	77.6	8.6	5.2	1.7	0.9	1.7	0.9	0.9	0.9	0.0	0.0	1.7	
Weekend	9	0	1	1	0	0	0	0	0	0	0	0	10
(%)	90.0	0.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 23 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	13	1	0	0	0	0	0	0	0	0	0	0	14
(%)	92.9	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Fri*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week

	7	1	0	0	0	0	0	0	0	0	0	0	7
(%)	92.9	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Weekdays

	7	1	0	0	0	0	0	0	0	0	0	0	7
(%)	92.9	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Weekend No complete days.

*** - Incomplete**

MetroCount Traffic Executive
Daily Classes

DailyClass-6 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 619 / 1245 (49.72%)

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 19 July 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed	10	0	0	0	0	0	0	0	0	0	0	3	13
(%)	76.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.1	
Thu	18	0	0	0	0	0	0	0	2	0	0	0	20
(%)	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	
Fri	18	1	2	0	0	0	0	0	0	0	0	1	22
(%)	81.8	4.5	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	
Sat	12	0	2	0	0	0	0	0	0	0	0	0	14
(%)	85.7	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	8	0	1	0	0	0	0	0	0	0	0	0	9
(%)	88.9	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week													
	11	0	1	0	0	0	0	0	0	0	0	1	13
(%)	84.6	1.3	6.4	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	5.1	
Weekdays													
	12	0	1	0	0	0	0	0	1	0	0	1	14
(%)	83.6	1.8	3.6	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	7.3	
Weekend													
	10	0	2	0	0	0	0	0	0	0	0	0	12
(%)	87.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 26 July 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	14	0	1	1	0	0	0	0	1	0	0	0	17
(%)	82.4	0.0	5.9	5.9	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0	
Tue	8	0	0	0	0	0	0	0	1	0	0	0	9
(%)	88.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	
Wed	11	0	0	0	0	0	0	0	0	0	0	0	11
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu	13	5	1	0	0	0	0	0	1	0	0	0	20
(%)	65.0	25.0	5.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	
Fri	19	1	1	0	0	0	0	0	0	0	0	3	24
(%)	79.2	4.2	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	
Sat	22	0	1	0	0	0	0	0	0	0	0	0	23
(%)	95.7	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	11	1	0	0	0	0	0	0	1	0	0	0	13
(%)	84.6	7.7	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0	0.0	

Average daily volume

Entire week													
	14	1	1	0	0	0	0	0	1	0	0	0	17
(%)	83.8	6.0	3.4	0.9	0.0	0.0	0.0	0.0	3.4	0.0	0.0	2.6	
Weekdays													
	13	1	1	0	0	0	0	0	1	0	0	1	16
(%)	80.2	7.4	3.7	1.2	0.0	0.0	0.0	0.0	3.7	0.0	0.0	3.7	
Weekend													
	17	1	1	0	0	0	0	0	1	0	0	0	18
(%)	91.7	2.8	2.8	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 2 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	15	1	0	0	0	0	0	0	0	0	0	0	16
(%)	93.8	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	10	2	1	0	0	0	0	0	0	0	1	0	14
(%)	71.4	14.3	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	
Wed	21	2	3	1	0	0	1	0	0	0	0	3	31
(%)	67.7	6.5	9.7	3.2	0.0	0.0	3.2	0.0	0.0	0.0	0.0	9.7	
Thu	19	2	3	3	0	0	0	0	1	0	0	0	28
(%)	67.9	7.1	10.7	10.7	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	
Fri	25	1	1	0	0	0	0	0	1	0	0	0	28
(%)	89.3	3.6	3.6	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	
Sat	15	0	1	0	0	0	0	1	0	0	0	1	18
(%)	83.3	0.0	5.6	0.0	0.0	0.0	0.0	5.6	0.0	0.0	0.0	5.6	
Sun	15	0	0	0	0	0	0	0	0	0	0	0	15
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week	17	1	1	1	0	0	0	0	0	0	0	1	21
(%)	80.0	5.3	6.0	2.7	0.0	0.0	0.7	0.7	1.3	0.0	0.7	2.7	
Weekdays	18	2	2	1	0	0	0	0	0	0	0	1	23
(%)	76.9	6.8	6.8	3.4	0.0	0.0	0.9	0.0	1.7	0.0	0.9	2.6	
Weekend	15	0	1	0	0	0	0	1	0	0	0	1	17
(%)	90.9	0.0	3.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 9 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	15	0	0	2	0	0	0	0	0	0	0	1	18
(%)	83.3	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	
Tue	10	1	2	0	0	0	1	0	0	0	0	2	16
(%)	62.5	6.3	12.5	0.0	0.0	0.0	6.3	0.0	0.0	0.0	0.0	12.5	
Wed	15	1	1	0	0	0	0	0	0	0	1	3	21
(%)	71.4	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	14.3	
Thu	16	2	0	0	0	0	0	0	1	1	0	1	21
(%)	76.2	9.5	0.0	0.0	0.0	0.0	0.0	0.0	4.8	4.8	0.0	4.8	
Fri	9	0	0	0	0	0	0	0	1	0	0	0	10
(%)	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	
Sat	22	0	2	0	0	0	1	0	0	0	0	0	25
(%)	88.0	0.0	8.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	
Sun	13	2	0	0	0	0	0	0	1	0	0	0	16
(%)	81.3	12.5	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0	

Average daily volume

Entire week													
	14	1	1	0	0	0	0	0	0	0	0	1	18
(%)	78.7	4.7	3.9	1.6	0.0	0.0	1.6	0.0	2.4	0.8	0.8	5.5	
Weekdays													
	13	1	1	0	0	0	0	0	0	0	0	1	17
(%)	75.6	4.7	3.5	2.3	0.0	0.0	1.2	0.0	2.3	1.2	1.2	8.1	
Weekend													
	18	1	1	0	0	0	1	0	1	0	0	0	21
(%)	85.4	4.9	4.9	0.0	0.0	0.0	2.4	0.0	2.4	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 16 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	18	3	2	0	0	0	0	0	0	0	0	0	23
(%)	78.3	13.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	18	3	0	0	0	0	0	0	0	0	0	2	23
(%)	78.3	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	
Wed	10	0	0	0	1	0	0	0	0	0	0	0	11
(%)	90.9	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu	18	1	1	0	0	0	0	0	1	0	0	0	21
(%)	85.7	4.8	4.8	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	
Fri	19	1	2	0	0	0	0	0	0	0	0	0	22
(%)	86.4	4.5	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat	17	1	1	1	0	0	0	0	0	0	0	0	20
(%)	85.0	5.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun	9	0	0	0	0	0	0	0	0	0	0	0	9
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week													
	16	1	1	0	0	0	0	0	0	0	0	0	18
(%)	84.5	7.0	4.7	0.8	0.8	0.0	0.0	0.0	0.8	0.0	0.0	1.6	
Weekdays													
	17	2	1	0	0	0	0	0	0	0	0	0	20
(%)	83.0	8.0	5.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	2.0	
Weekend													
	13	1	1	1	0	0	0	0	0	0	0	0	15
(%)	89.7	3.4	3.4	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

*** - Incomplete**

Daily Classes

DailyClass-6
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Monday, 23 August 2021

	1	2	3	4	5	6	7	8	9	10	11	12	Total
Mon	16	0	0	0	0	0	0	0	0	0	0	0	16
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Tue	2	0	0	0	0	0	0	0	0	0	0	0	2
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wed*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Thu*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Fri*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sat*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sun*	0	0	0	0	0	0	0	0	0	0	0	0	0
(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average daily volume

Entire week													
	9	0	0	0	0	0	0	0	0	0	0	0	9
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Weekdays													
	9	0	0	0	0	0	0	0	0	0	0	0	9
(%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Weekend No complete days.

*** - Incomplete**

MetroCount Traffic Executive
Speed Statistics

SpeedStat-4 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 1239 / 1245 (99.52%)

Speed Statistics

SpeedStat-4
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Vehicles = 1239
Posted speed limit = 110 km/h, Exceeding = 53 (4.278%), Mean Exceeding = 116.10 km/h
Maximum = 127.9 km/h, **Minimum** = 14.4 km/h, **Mean** = 82.4 km/h
85% Speed = 98.64 km/h, **95% Speed** = 109.26 km/h, **Median** = 83.70 km/h
20 km/h Pace = 74 - 94, **Number in Pace** = 582 (46.97%)
Variance = 283.98, **Standard Deviation** = 16.85 km/h

Speed Bins (Partial days)

Speed	Bin	Below	Above	Energy	vMult	n * vMult
0 - **10**	0 0.000%	0 0.000%	1239 100.0%	0.00	0.00	0.00
10 - **20**	2 0.161%	2 0.161%	1237 99.84%	0.00	0.00	0.00
20 - **30**	3 0.242%	5 0.404%	1234 99.60%	0.00	0.00	0.00
30 - **40**	12 0.969%	17 1.372%	1222 98.63%	0.00	0.00	0.00
40 - **50**	20 1.614%	37 2.986%	1202 97.01%	0.00	0.00	0.00
50 - **60**	85 6.860%	122 9.847%	1117 90.15%	0.00	0.00	0.00
60 - **70**	165 13.32%	287 23.16%	952 76.84%	0.00	0.00	0.00
70 - **80**	233 18.81%	520 41.97%	719 58.03%	0.00	0.00	0.00
80 - **90**	302 24.37%	822 66.34%	417 33.66%	0.00	0.00	0.00
90 - **100**	256 20.66%	1078 87.01%	161 12.99%	0.00	0.00	0.00
100 - **110**	108 8.717%	1186 95.72%	53 4.278%	0.00	0.00	0.00
110 - **120**	37 2.986%	1223 98.71%	16 1.291%	0.00	0.00	0.00
120 - **130**	16 1.291%	1239 100.0%	0 0.000%	0.00	0.00	0.00
130 - **140**	0 0.000%	1239 100.0%	0 0.000%	0.00	0.00	0.00
140 - **150**	0 0.000%	1239 100.0%	0 0.000%	0.00	0.00	0.00
150 - **160**	0 0.000%	1239 100.0%	0 0.000%	0.00	0.00	0.00
160 - **170**	0 0.000%	1239 100.0%	0 0.000%	0.00	0.00	0.00
170 - **180**	0 0.000%	1239 100.0%	0 0.000%	0.00	0.00	0.00
180 - **190**	0 0.000%	1239 100.0%	0 0.000%	0.00	0.00	0.00
190 - **200**	0 0.000%	1239 100.0%	0 0.000%	0.00	0.00	0.00

Total Speed Rating = 0.00
Total Moving Energy (Estimated) = 0.00

Speed limit fields (Partial days)

	Limit	Below	Above
0	110 (PSL)	1186 95.7%	53 4.3%

MetroCount Traffic Executive
Speed Statistics

SpeedStat-4 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 620 / 1245 (49.80%)

Speed Statistics

SpeedStat-4
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Vehicles = 620
Posted speed limit = 110 km/h, Exceeding = 39 (6.290%), Mean Exceeding = 115.31 km/h
Maximum = 127.9 km/h, **Minimum** = 16.2 km/h, **Mean** = 84.8 km/h
85% Speed = 101.13 km/h, **95% Speed** = 111.77 km/h, **Median** = 86.76 km/h
20 km/h Pace = 79 - 99, **Number in Pace** = 298 (48.06%)
Variance = 291.31, **Standard Deviation** = 17.07 km/h

Speed Bins (Partial days)

Speed	Bin	Below	Above	Energy	vMult	n * vMult
0 - **10**	0 0.000%	0 0.000%	620 100.0%	0.00	0.00	0.00
10 - **20**	1 0.161%	1 0.161%	619 99.84%	0.00	0.00	0.00
20 - **30**	1 0.161%	2 0.323%	618 99.68%	0.00	0.00	0.00
30 - **40**	7 1.129%	9 1.452%	611 98.55%	0.00	0.00	0.00
40 - **50**	7 1.129%	16 2.581%	604 97.42%	0.00	0.00	0.00
50 - **60**	31 5.000%	47 7.581%	573 92.42%	0.00	0.00	0.00
60 - **70**	77 12.42%	124 20.00%	496 80.00%	0.00	0.00	0.00
70 - **80**	102 16.45%	226 36.45%	394 63.55%	0.00	0.00	0.00
80 - **90**	145 23.39%	371 59.84%	249 40.16%	0.00	0.00	0.00
90 - **100**	146 23.55%	517 83.39%	103 16.61%	0.00	0.00	0.00
100 - **110**	64 10.32%	581 93.71%	39 6.290%	0.00	0.00	0.00
110 - **120**	30 4.839%	611 98.55%	9 1.452%	0.00	0.00	0.00
120 - **130**	9 1.452%	620 100.0%	0 0.000%	0.00	0.00	0.00
130 - **140**	0 0.000%	620 100.0%	0 0.000%	0.00	0.00	0.00
140 - **150**	0 0.000%	620 100.0%	0 0.000%	0.00	0.00	0.00
150 - **160**	0 0.000%	620 100.0%	0 0.000%	0.00	0.00	0.00
160 - **170**	0 0.000%	620 100.0%	0 0.000%	0.00	0.00	0.00
170 - **180**	0 0.000%	620 100.0%	0 0.000%	0.00	0.00	0.00
180 - **190**	0 0.000%	620 100.0%	0 0.000%	0.00	0.00	0.00
190 - **200**	0 0.000%	620 100.0%	0 0.000%	0.00	0.00	0.00

Total Speed Rating = 0.00
Total Moving Energy (Estimated) = 0.00

Speed limit fields (Partial days)

	Limit	Below	Above
0	110 (PSL)	581 93.7%	39 6.3%

MetroCount Traffic Executive
Speed Statistics

SpeedStat-4 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 619 / 1245 (49.72%)

Speed Statistics

SpeedStat-4
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Vehicles = 619
Posted speed limit = 110 km/h, Exceeding = 14 (2.262%), Mean Exceeding = 118.31 km/h
Maximum = 127.8 km/h, **Minimum** = 14.4 km/h, **Mean** = 79.9 km/h
85% Speed = 96.48 km/h, **95% Speed** = 104.76 km/h, **Median** = 81.18 km/h
20 km/h Pace = 73 - 93, **Number in Pace** = 308 (49.76%)
Variance = 264.94, **Standard Deviation** = 16.28 km/h

Speed Bins (Partial days)

Speed	Bin	Below	Above	Energy	vMult	n * vMult
0 - **10**	0 0.000%	0 0.000%	619 100.0%	0.00	0.00	0.00
10 - **20**	1 0.162%	1 0.162%	618 99.84%	0.00	0.00	0.00
20 - **30**	2 0.323%	3 0.485%	616 99.52%	0.00	0.00	0.00
30 - **40**	5 0.808%	8 1.292%	611 98.71%	0.00	0.00	0.00
40 - **50**	13 2.100%	21 3.393%	598 96.61%	0.00	0.00	0.00
50 - **60**	54 8.724%	75 12.12%	544 87.88%	0.00	0.00	0.00
60 - **70**	88 14.22%	163 26.33%	456 73.67%	0.00	0.00	0.00
70 - **80**	131 21.16%	294 47.50%	325 52.50%	0.00	0.00	0.00
80 - **90**	157 25.36%	451 72.86%	168 27.14%	0.00	0.00	0.00
90 - **100**	110 17.77%	561 90.63%	58 9.370%	0.00	0.00	0.00
100 - **110**	44 7.108%	605 97.74%	14 2.262%	0.00	0.00	0.00
110 - **120**	7 1.131%	612 98.87%	7 1.131%	0.00	0.00	0.00
120 - **130**	7 1.131%	619 100.0%	0 0.000%	0.00	0.00	0.00
130 - **140**	0 0.000%	619 100.0%	0 0.000%	0.00	0.00	0.00
140 - **150**	0 0.000%	619 100.0%	0 0.000%	0.00	0.00	0.00
150 - **160**	0 0.000%	619 100.0%	0 0.000%	0.00	0.00	0.00
160 - **170**	0 0.000%	619 100.0%	0 0.000%	0.00	0.00	0.00
170 - **180**	0 0.000%	619 100.0%	0 0.000%	0.00	0.00	0.00
180 - **190**	0 0.000%	619 100.0%	0 0.000%	0.00	0.00	0.00
190 - **200**	0 0.000%	619 100.0%	0 0.000%	0.00	0.00	0.00

Total Speed Rating = 0.00
Total Moving Energy (Estimated) = 0.00

Speed limit fields (Partial days)

	Limit	Below	Above
0	110 (PSL)	605 97.7%	14 2.3%

MetroCount Traffic Executive
Weekly Vehicle Counts

WeeklyVehicle-3 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 1239 / 1245 (99.52%)

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	19 Jul	20 Jul	21 Jul	22 Jul	23 Jul	24 Jul	25 Jul	1 - 5	1 - 7
Hour									
0000-0100	*	0	0	0	0	0	0	0.0	0.0
0100-0200	*	0	0	0	0	0	0	0.0	0.0
0200-0300	*	0	0	0	0	0	0	0.0	0.0
0300-0400	*	0	0	0	0	0	0	0.0	0.0
0400-0500	*	0	0	1	0	0	0	0.3	0.2
0500-0600	*	0	0	0	0	0	0	0.0	0.0
0600-0700	*	0	0	1	1	1	0	0.5	0.5
0700-0800	*	0	0	4	3	2	0	1.8	1.5
0800-0900	*	0	0	3	1	1	0	1.0	0.8
0900-1000	*	0	0	**13**	2	**5**	0	**3.8**	**3.3**
1000-1100	*	0	0	4	**4**	4	**2**	2.0	2.3
1100-1200	*	**0**	**0**	3	2	3	0	1.3	1.3
1200-1300	*	0	2	3	2	1	1	1.8	1.5
1300-1400	0	0	0	**5**	2	1	2	1.4	1.4
1400-1500	0	0	0	2	3	**4**	4	1.0	1.9
1500-1600	0	0	4	2	1	0	**5**	1.4	1.7
1600-1700	0	0	**7**	2	0	1	1	**1.8**	1.6
1700-1800	0	0	1	1	**5**	3	3	1.4	**1.9**
1800-1900	0	0	3	1	4	3	1	1.6	1.7
1900-2000	0	0	2	1	4	0	0	1.4	1.0
2000-2100	0	0	2	0	1	1	1	0.6	0.7
2100-2200	0	0	2	0	2	0	0	0.8	0.6
2200-2300	0	0	0	0	0	0	0	0.0	0.0
2300-2400	0	**0**	0	0	3	0	0	0.6	0.4
Totals									
0700-1900	*	0	17	43	29	28	19	20.1	21.0
0600-2200	*	0	23	45	37	30	20	23.4	23.8
0600-0000	*	0	23	45	40	30	20	24.0	24.2
0000-0000	*	0	23	46	40	30	20	24.3	24.4
AM Peak	*	1100	1100	0900	1000	0900	1000		
	*	0	0	13	4	5	2		
PM Peak	*	2300	1600	1300	1700	1400	1500		
	*	0	7	5	5	4	5		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon 26 Jul	Tue 27 Jul	Wed 28 Jul	Thu 29 Jul	Fri 30 Jul	Sat 31 Jul	Sun 01 Aug	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	0	0	0	0	0	2	0	0.0	0.3
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	1	0	0	0	0.2	0.1
0400-0500	0	0	0	2	0	0	0	0.4	0.3
0500-0600	0	0	0	1	1	0	0	0.4	0.3
0600-0700	1	0	0	2	0	0	0	0.6	0.4
0700-0800	1	0	2	2	1	1	2	1.2	1.3
0800-0900	2	2	1	0	2	1	1	1.4	1.3
0900-1000	2	1	4	3	3	0	4	2.6	2.4
1000-1100	**2**	2	**4**	**12**	2	**7**	0	**4.4**	**4.1**
1100-1200	0	**4**	0	3	**6**	3	**5**	2.6	3.0
1200-1300	1	**5**	2	1	2	**13**	**5**	2.2	**4.1**
1300-1400	**5**	1	1	**5**	**6**	3	3	**3.6**	3.4
1400-1500	3	1	0	2	2	1	0	1.6	1.3
1500-1600	1	0	1	4	3	2	1	1.8	1.7
1600-1700	0	2	**4**	2	4	2	1	2.4	2.1
1700-1800	4	0	2	2	3	1	1	2.2	1.9
1800-1900	1	1	3	1	2	0	0	1.6	1.1
1900-2000	0	1	1	0	0	6	1	0.4	1.3
2000-2100	0	0	0	1	3	2	0	0.8	0.9
2100-2200	4	0	2	1	0	2	0	1.4	1.3
2200-2300	0	0	0	1	1	0	0	0.4	0.3
2300-2400	0	0	1	0	0	0	0	0.2	0.1
Totals									
0700-1900	22	19	24	37	36	34	23	27.6	27.9
0600-2200	27	20	27	41	39	44	24	30.8	31.7
0600-0000	27	20	28	42	40	44	24	31.4	32.1
0000-0000	27	20	28	46	41	46	24	32.4	33.1
AM Peak	1000	1100	1000	1000	1100	1000	1100		
	2	4	4	12	6	7	5		
PM Peak	1300	1200	1600	1300	1300	1200	1200		
	5	5	4	5	6	13	5		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	02 Aug	03 Aug	04 Aug	05 Aug	06 Aug	07 Aug	08 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	0	1	0.0	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	4	0	0	0.8	0.6
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	1	0	0	0	0.2	0.1
0500-0600	1	1	0	0	0	0	0	0.4	0.3
0600-0700	0	0	1	3	2	0	0	1.2	0.9
0700-0800	1	2	2	6	0	0	0	2.2	1.6
0800-0900	3	2	**8**	**6**	4	3	2	**4.6**	4.0
0900-1000	4	**5**	5	2	5	3	1	4.2	3.6
1000-1100	1	2	3	3	2	4	2	2.2	2.4
1100-1200	**4**	0	2	5	**5**	**6**	**9**	3.2	**4.4**
1200-1300	1	1	7	2	5	3	3	3.2	3.1
1300-1400	**6**	1	3	5	3	**5**	4	3.6	**3.9**
1400-1500	2	2	4	**5**	4	1	0	3.4	2.6
1500-1600	0	4	2	4	**7**	3	2	3.4	3.1
1600-1700	1	**4**	**11**	4	5	0	0	**5.0**	3.6
1700-1800	1	0	4	2	3	2	**5**	2.0	2.4
1800-1900	1	1	2	3	2	4	0	1.8	1.9
1900-2000	1	1	1	1	5	3	1	1.8	1.9
2000-2100	0	0	3	1	1	1	0	1.0	0.9
2100-2200	0	0	1	1	2	0	1	0.8	0.7
2200-2300	1	0	0	0	1	1	0	0.4	0.4
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	25	24	53	47	45	34	28	38.8	36.6
0600-2200	26	25	59	53	55	38	30	43.6	40.9
0600-0000	27	25	59	53	56	39	30	44.0	41.3
0000-0000	28	26	59	54	60	39	31	45.4	42.4
AM Peak	1100	0900	0800	0800	1100	1100	1100		
	4	5	8	6	5	6	9		
PM Peak	1300	1600	1600	1400	1500	1300	1700		
	6	4	11	5	7	5	5		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	09 Aug	10 Aug	11 Aug	12 Aug	13 Aug	14 Aug	15 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	1	0	0	0	0.2	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	1	0	0	0	0.2	0.1
0500-0600	0	1	1	0	0	0	0	0.4	0.3
0600-0700	2	2	1	5	2	2	2	2.4	2.3
0700-0800	2	0	2	2	1	1	0	1.4	1.1
0800-0900	2	2	4	3	3	3	3	2.8	2.9
0900-1000	6	**4**	3	2	0	3	**4**	3.0	3.1
1000-1100	**7**	2	2	**7**	2	**6**	1	**4.0**	**3.9**
1100-1200	2	0	**4**	3	**3**	3	2	2.4	2.4
1200-1300	3	1	**6**	**6**	4	2	2	**4.0**	**3.4**
1300-1400	1	**5**	2	1	4	1	2	2.6	2.3
1400-1500	1	2	2	4	0	**6**	2	1.8	2.4
1500-1600	1	2	4	1	**4**	2	**4**	2.4	2.6
1600-1700	**5**	1	0	5	3	2	0	2.8	2.3
1700-1800	4	4	1	1	3	3	2	2.6	2.6
1800-1900	1	1	2	3	0	4	2	1.4	1.9
1900-2000	0	1	0	0	1	2	0	0.4	0.6
2000-2100	1	1	3	1	0	3	0	1.2	1.3
2100-2200	0	0	3	0	0	0	1	0.6	0.6
2200-2300	0	0	0	0	0	0	1	0.0	0.1
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	35	24	32	38	27	36	24	31.2	30.9
0600-2200	38	28	39	44	30	43	27	35.8	35.6
0600-0000	38	28	39	44	30	43	28	35.8	35.7
0000-0000	38	29	40	46	30	43	28	36.6	36.3
AM Peak	1000	0900	1100	1000	1100	1000	0900		
	7	4	4	7	3	6	4		
PM Peak	1600	1300	1200	1200	1500	1400	1500		
	5	5	6	6	4	6	4		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	16 Aug	17 Aug	18 Aug	19 Aug	20 Aug	21 Aug	22 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	1	0	0	0	0	0.2	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	1	1	0	0	0.4	0.3
0500-0600	1	0	0	0	0	0	0	0.2	0.1
0600-0700	1	0	2	0	0	0	0	0.6	0.4
0700-0800	2	2	2	6	**10**	0	0	4.4	3.1
0800-0900	3	6	0	3	3	1	0	3.0	2.3
0900-1000	**6**	**10**	**4**	5	6	**6**	1	**6.2**	**5.4**
1000-1100	3	1	3	**6**	3	5	**3**	3.2	3.4
1100-1200	4	1	3	1	3	3	1	2.4	2.3
1200-1300	3	3	0	4	4	3	2	2.8	2.7
1300-1400	5	2	0	1	4	1	2	2.4	2.1
1400-1500	**7**	4	2	3	4	2	2	4.0	3.4
1500-1600	0	4	**3**	**10**	**5**	0	**2**	4.4	3.4
1600-1700	6	**5**	2	5	4	**6**	0	**4.4**	**4.0**
1700-1800	1	2	2	0	4	5	0	1.8	2.0
1800-1900	0	1	1	1	0	2	1	0.6	0.9
1900-2000	2	1	0	1	0	1	0	0.8	0.7
2000-2100	1	0	1	0	0	0	0	0.4	0.3
2100-2200	0	0	0	3	0	0	0	0.6	0.4
2200-2300	0	0	0	1	1	0	0	0.4	0.3
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	40	41	22	45	50	34	14	39.6	35.1
0600-2200	44	42	25	49	50	35	14	42.0	37.0
0600-0000	44	42	25	50	51	35	14	42.4	37.3
0000-0000	45	42	26	51	52	35	14	43.2	37.9
AM Peak	0900	0900	0900	1000	0700	0900	1000		
	6	10	4	6	10	6	3		
PM Peak	1400	1600	1500	1500	1500	1600	1500		
	7	5	3	10	5	6	2		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	23 Aug	24 Aug	25 Aug	26 Aug	27 Aug	28 Aug	29 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	*	*	*	*	0.0	0.0
0100-0200	0	0	0	*	*	*	*	0.0	0.0
0200-0300	0	0	0	*	*	*	*	0.0	0.0
0300-0400	0	0	0	*	*	*	*	0.0	0.0
0400-0500	0	0	0	*	*	*	*	0.0	0.0
0500-0600	0	0	0	*	*	*	*	0.0	0.0
0600-0700	0	0	0	*	*	*	*	0.0	0.0
0700-0800	1	0	0	*	*	*	*	0.3	0.3
0800-0900	1	0	0	*	*	*	*	0.3	0.3
0900-1000	4	0	0	*	*	*	*	1.3	1.3
1000-1100	3	0	0	*	*	*	*	1.0	1.0
1100-1200	**5**	**0**	*	*	*	*	*	**2.5**	**2.5**
1200-1300	3	0	*	*	*	*	*	1.5	1.5
1300-1400	5	**2**	*	*	*	*	*	3.5	3.5
1400-1500	**8**	0	*	*	*	*	*	**4.0**	**4.0**
1500-1600	0	0	*	*	*	*	*	0.0	0.0
1600-1700	0	0	*	*	*	*	*	0.0	0.0
1700-1800	0	0	*	*	*	*	*	0.0	0.0
1800-1900	0	0	*	*	*	*	*	0.0	0.0
1900-2000	0	0	*	*	*	*	*	0.0	0.0
2000-2100	0	0	*	*	*	*	*	0.0	0.0
2100-2200	0	0	*	*	*	*	*	0.0	0.0
2200-2300	0	0	*	*	*	*	*	0.0	0.0
2300-2400	0	0	*	*	*	*	*	0.0	0.0
Totals									
0700-1900	30	2	*	*	*	*	*	14.5	14.5
0600-2200	30	2	*	*	*	*	*	14.5	14.5
0600-0000	30	2	*	*	*	*	*	14.5	14.5
0000-0000	30	2	*	*	*	*	*	14.5	14.5
AM Peak	1100	1100	*	*	*	*	*		
	5	0	*	*	*	*	*		
PM Peak	1400	1300	*	*	*	*	*		
	8	2	*	*	*	*	*		

*** - No data.**

MetroCount Traffic Executive
Weekly Vehicle Counts

WeeklyVehicle-3 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 620 / 1245 (49.80%)

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	19 Jul	20 Jul	21 Jul	22 Jul	23 Jul	24 Jul	25 Jul	1 - 5	1 - 7
Hour									
0000-0100	*	0	0	0	0	0	0	0.0	0.0
0100-0200	*	0	0	0	0	0	0	0.0	0.0
0200-0300	*	0	0	0	0	0	0	0.0	0.0
0300-0400	*	0	0	0	0	0	0	0.0	0.0
0400-0500	*	0	0	0	0	0	0	0.0	0.0
0500-0600	*	0	0	0	0	0	0	0.0	0.0
0600-0700	*	0	0	1	0	1	0	0.3	0.3
0700-0800	*	0	0	1	1	2	0	0.5	0.7
0800-0900	*	0	0	0	1	0	0	0.3	0.2
0900-1000	*	0	0	**7**	1	**4**	0	**2.0**	**2.0**
1000-1100	*	0	0	4	2	3	**1**	1.5	1.7
1100-1200	*	**0**	**0**	2	**2**	2	0	1.0	1.0
1200-1300	*	0	1	2	1	1	1	1.0	1.0
1300-1400	0	0	0	**5**	2	0	1	**1.4**	**1.1**
1400-1500	0	0	0	1	2	1	3	0.6	1.0
1500-1600	0	0	2	0	1	0	**3**	0.6	0.9
1600-1700	0	0	**4**	2	0	1	0	1.2	1.0
1700-1800	0	0	0	0	2	**1**	1	0.4	0.6
1800-1900	0	0	2	0	**3**	0	1	1.0	0.9
1900-2000	0	0	1	1	0	0	0	0.4	0.3
2000-2100	0	0	0	0	0	0	0	0.0	0.0
2100-2200	0	0	0	0	0	0	0	0.0	0.0
2200-2300	0	0	0	0	0	0	0	0.0	0.0
2300-2400	0	**0**	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	*	0	9	24	18	15	11	11.4	11.9
0600-2200	*	0	10	26	18	16	11	12.1	12.5
0600-0000	*	0	10	26	18	16	11	12.1	12.5
0000-0000	*	0	10	26	18	16	11	12.1	12.5
AM Peak	*	1100	1100	0900	1100	0900	1000		
	*	0	0	7	2	4	1		
PM Peak	*	2300	1600	1300	1800	1700	1500		
	*	0	4	5	3	1	3		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	26 Jul	27 Jul	28 Jul	29 Jul	30 Jul	31 Jul	01 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	1	0	0.0	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	1	0	0	0	0.2	0.1
0400-0500	0	0	0	0	0	0	0	0.0	0.0
0500-0600	0	0	0	1	0	0	0	0.2	0.1
0600-0700	0	0	0	2	0	0	0	0.4	0.3
0700-0800	1	0	1	0	0	1	1	0.4	0.6
0800-0900	0	1	1	0	2	0	0	0.8	0.6
0900-1000	0	0	2	0	1	0	0	0.6	0.4
1000-1100	**1**	2	**3**	**5**	1	**7**	0	**2.4**	**2.7**
1100-1200	0	**3**	0	2	**2**	3	**3**	1.4	1.9
1200-1300	0	**3**	1	1	2	**6**	2	1.4	**2.1**
1300-1400	3	0	1	**5**	2	1	**2**	**2.2**	2.0
1400-1500	1	1	0	2	2	0	0	1.2	0.9
1500-1600	1	0	1	2	**3**	1	0	1.4	1.1
1600-1700	0	1	2	1	0	1	1	0.8	0.9
1700-1800	**3**	0	**2**	1	2	0	1	1.6	1.3
1800-1900	0	0	1	1	0	0	0	0.4	0.3
1900-2000	0	0	1	0	0	1	1	0.2	0.4
2000-2100	0	0	0	1	0	0	0	0.2	0.1
2100-2200	0	0	0	1	0	1	0	0.2	0.3
2200-2300	0	0	0	0	0	0	0	0.0	0.0
2300-2400	0	0	1	0	0	0	0	0.2	0.1
Totals									
0700-1900	10	11	15	20	17	20	10	14.6	14.7
0600-2200	10	11	16	24	17	22	11	15.6	15.9
0600-0000	10	11	17	24	17	22	11	15.8	16.0
0000-0000	10	11	17	26	17	23	11	16.2	16.4
AM Peak	1000	1100	1000	1000	1100	1000	1100		
	1	3	3	5	2	7	3		
PM Peak	1700	1200	1700	1300	1500	1200	1300		
	3	3	2	5	3	6	2		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	02 Aug	03 Aug	04 Aug	05 Aug	06 Aug	07 Aug	08 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	0	0	0.0	0.0
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	0	0	0	0	0.0	0.0
0500-0600	0	0	0	0	0	0	0	0.0	0.0
0600-0700	0	0	1	0	1	0	0	0.4	0.3
0700-0800	0	0	0	2	0	0	0	0.4	0.3
0800-0900	1	1	**7**	2	2	1	1	**2.6**	2.1
0900-1000	0	**2**	1	2	2	3	1	1.4	1.6
1000-1100	1	1	2	2	1	**4**	2	1.4	1.9
1100-1200	**2**	0	1	**4**	**3**	3	**7**	2.0	**2.9**
1200-1300	1	0	**4**	2	3	2	1	2.0	1.9
1300-1400	**4**	1	3	**4**	3	**3**	2	**3.0**	**2.9**
1400-1500	2	0	3	2	1	1	0	1.6	1.3
1500-1600	0	3	1	2	4	1	0	2.0	1.6
1600-1700	1	**3**	2	3	4	0	0	2.6	1.9
1700-1800	0	0	2	0	0	2	**2**	0.4	0.9
1800-1900	0	0	0	1	2	0	0	0.6	0.4
1900-2000	0	1	0	0	**4**	0	0	1.0	0.7
2000-2100	0	0	1	0	0	0	0	0.2	0.1
2100-2200	0	0	0	0	1	0	0	0.2	0.1
2200-2300	0	0	0	0	1	1	0	0.2	0.3
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	12	11	26	26	25	20	16	20.0	19.4
0600-2200	12	12	28	26	31	20	16	21.8	20.7
0600-0000	12	12	28	26	32	21	16	22.0	21.0
0000-0000	12	12	28	26	32	21	16	22.0	21.0
AM Peak	1100	0900	0800	1100	1100	1000	1100		
	2	2	7	4	3	4	7		
PM Peak	1300	1600	1200	1300	1900	1300	1700		
	4	3	4	4	4	3	2		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	09 Aug	10 Aug	11 Aug	12 Aug	13 Aug	14 Aug	15 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	0	0	0.0	0.0
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	0	0	0	0	0.0	0.0
0500-0600	0	1	0	0	0	0	0	0.2	0.1
0600-0700	0	0	0	4	1	0	0	1.0	0.7
0700-0800	1	0	1	0	1	1	0	0.6	0.6
0800-0900	2	1	2	3	**3**	2	1	**2.2**	**2.0**
0900-1000	2	**2**	1	0	0	3	1	1.0	1.3
1000-1100	**4**	1	0	**4**	0	**4**	0	1.8	1.9
1100-1200	1	0	**3**	3	2	3	**1**	1.8	1.9
1200-1300	2	0	3	2	4	1	2	**2.2**	**2.0**
1300-1400	1	2	1	1	**4**	1	2	1.8	1.7
1400-1500	1	2	1	1	0	**2**	2	1.0	1.3
1500-1600	0	0	**4**	0	2	0	**2**	1.2	1.1
1600-1700	**3**	0	0	**3**	2	0	0	1.6	1.1
1700-1800	2	**3**	1	1	1	1	1	1.6	1.4
1800-1900	1	1	0	2	0	0	0	0.8	0.6
1900-2000	0	0	0	0	0	0	0	0.0	0.0
2000-2100	0	0	1	1	0	0	0	0.4	0.3
2100-2200	0	0	1	0	0	0	0	0.2	0.1
2200-2300	0	0	0	0	0	0	0	0.0	0.0
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	20	12	17	20	19	18	12	17.6	16.9
0600-2200	20	12	19	25	20	18	12	19.2	18.0
0600-0000	20	12	19	25	20	18	12	19.2	18.0
0000-0000	20	13	19	25	20	18	12	19.4	18.1
AM Peak	1000	0900	1100	1000	0800	1000	1100		
	4	2	3	4	3	4	1		
PM Peak	1600	1700	1500	1600	1300	1400	1500		
	3	3	4	3	4	2	2		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	16 Aug	17 Aug	18 Aug	19 Aug	20 Aug	21 Aug	22 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	0	0	0.0	0.0
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	0	0	0	0	0.0	0.0
0500-0600	0	0	0	0	0	0	0	0.0	0.0
0600-0700	0	0	2	0	0	0	0	0.4	0.3
0700-0800	1	0	2	4	**8**	0	0	3.0	2.1
0800-0900	3	2	0	1	3	0	0	1.8	1.3
0900-1000	**3**	**5**	2	**5**	5	3	1	**4.0**	**3.4**
1000-1100	1	0	**3**	4	3	**5**	**2**	2.2	2.6
1100-1200	1	1	2	1	2	2	0	1.4	1.3
1200-1300	2	1	0	4	2	**3**	0	1.8	**1.7**
1300-1400	4	1	0	1	1	1	1	1.4	1.3
1400-1500	3	**4**	**2**	1	0	0	0	2.0	1.4
1500-1600	0	1	1	**7**	1	0	**1**	2.0	1.6
1600-1700	**4**	2	1	1	2	1	0	**2.0**	1.6
1700-1800	0	1	0	0	**3**	0	0	0.8	0.6
1800-1900	0	1	0	0	0	0	0	0.2	0.1
1900-2000	0	0	0	0	0	0	0	0.0	0.0
2000-2100	0	0	0	0	0	0	0	0.0	0.0
2100-2200	0	0	0	1	0	0	0	0.2	0.1
2200-2300	0	0	0	0	0	0	0	0.0	0.0
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	22	19	13	29	30	15	5	22.6	19.0
0600-2200	22	19	15	30	30	15	5	23.2	19.4
0600-0000	22	19	15	30	30	15	5	23.2	19.4
0000-0000	22	19	15	30	30	15	5	23.2	19.4
AM Peak	0900	0900	1000	0900	0700	1000	1000		
	3	5	3	5	8	5	2		
PM Peak	1600	1400	1400	1500	1700	1200	1500		
	4	4	2	7	3	3	1		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NEW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	23 Aug	24 Aug	25 Aug	26 Aug	27 Aug	28 Aug	29 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	*	*	*	*	0.0	0.0
0100-0200	0	0	0	*	*	*	*	0.0	0.0
0200-0300	0	0	0	*	*	*	*	0.0	0.0
0300-0400	0	0	0	*	*	*	*	0.0	0.0
0400-0500	0	0	0	*	*	*	*	0.0	0.0
0500-0600	0	0	0	*	*	*	*	0.0	0.0
0600-0700	0	0	0	*	*	*	*	0.0	0.0
0700-0800	1	0	0	*	*	*	*	0.3	0.3
0800-0900	0	0	0	*	*	*	*	0.0	0.0
0900-1000	**2**	0	0	*	*	*	*	**0.7**	**0.7**
1000-1100	0	0	0	*	*	*	*	0.0	0.0
1100-1200	1	**0**	*	*	*	*	*	0.5	0.5
1200-1300	1	0	*	*	*	*	*	0.5	0.5
1300-1400	4	0	*	*	*	*	*	2.0	2.0
1400-1500	**5**	0	*	*	*	*	*	**2.5**	**2.5**
1500-1600	0	0	*	*	*	*	*	0.0	0.0
1600-1700	0	0	*	*	*	*	*	0.0	0.0
1700-1800	0	0	*	*	*	*	*	0.0	0.0
1800-1900	0	0	*	*	*	*	*	0.0	0.0
1900-2000	0	0	*	*	*	*	*	0.0	0.0
2000-2100	0	0	*	*	*	*	*	0.0	0.0
2100-2200	0	0	*	*	*	*	*	0.0	0.0
2200-2300	0	0	*	*	*	*	*	0.0	0.0
2300-2400	0	**0**	*	*	*	*	*	0.0	0.0
Totals									
0700-1900	14	0	*	*	*	*	*	6.5	6.5
0600-2200	14	0	*	*	*	*	*	6.5	6.5
0600-0000	14	0	*	*	*	*	*	6.5	6.5
0000-0000	14	0	*	*	*	*	*	6.5	6.5
AM Peak	0900	1100	*	*	*	*	*		
	2	0	*	*	*	*	*		
PM Peak	1400	2300	*	*	*	*	*		
	5	0	*	*	*	*	*		

*** - No data.**

MetroCount Traffic Executive
Weekly Vehicle Counts

WeeklyVehicle-3 -- English (ENA)

Datasets:

Site:	**[1] Calwynyardah - Noonkanbah Rd**
Attribute:	
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	13:45 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021,
Zone:	
File:	1 0 2021-08-25 1037.EC0 (Plus)
Identifier:	DQ4796QJ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.07)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021 (36.8687)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 619 / 1245 (49.72%)

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	19 Jul	20 Jul	21 Jul	22 Jul	23 Jul	24 Jul	25 Jul	1 - 5	1 - 7
Hour									
0000-0100	*	0	0	0	0	0	0	0.0	0.0
0100-0200	*	0	0	0	0	0	0	0.0	0.0
0200-0300	*	0	0	0	0	0	0	0.0	0.0
0300-0400	*	0	0	0	0	0	0	0.0	0.0
0400-0500	*	0	0	1	0	0	0	0.3	0.2
0500-0600	*	0	0	0	0	0	0	0.0	0.0
0600-0700	*	0	0	0	1	0	0	0.3	0.2
0700-0800	*	0	0	3	2	0	0	1.3	0.8
0800-0900	*	0	0	3	0	1	0	0.8	0.7
0900-1000	*	0	0	**6**	1	1	0	**1.8**	**1.3**
1000-1100	*	0	0	0	**2**	1	**1**	0.5	0.7
1100-1200	*	**0**	**0**	1	0	**1**	0	0.3	0.3
1200-1300	*	0	1	1	1	0	0	0.8	0.5
1300-1400	0	0	0	0	0	1	1	0.0	0.3
1400-1500	0	0	0	1	1	3	1	0.4	0.9
1500-1600	0	0	2	**2**	0	0	2	0.8	0.9
1600-1700	0	0	**3**	0	0	0	1	0.6	0.6
1700-1800	0	0	1	1	3	2	**2**	1.0	**1.3**
1800-1900	0	0	1	1	1	**3**	0	0.6	0.9
1900-2000	0	0	1	0	**4**	0	0	**1.0**	0.7
2000-2100	0	0	2	0	1	1	1	0.6	0.7
2100-2200	0	0	2	0	2	0	0	0.8	0.6
2200-2300	0	0	0	0	0	0	0	0.0	0.0
2300-2400	0	**0**	0	0	3	0	0	0.6	0.4
Totals									
0700-1900	*	0	8	19	11	13	8	8.7	9.0
0600-2200	*	0	13	19	19	14	9	11.3	11.2
0600-0000	*	0	13	19	22	14	9	11.9	11.6
0000-0000	*	0	13	20	22	14	9	12.2	11.8
AM Peak	*	1100	1100	0900	1000	1100	1000		
	*	0	0	6	2	1	1		
PM Peak	*	2300	1600	1500	1900	1800	1700		
	*	0	3	2	4	3	2		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	26 Jul	27 Jul	28 Jul	29 Jul	30 Jul	31 Jul	01 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	1	0	0.0	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	2	0	0	0	0.4	0.3
0500-0600	0	0	0	0	1	0	0	0.2	0.1
0600-0700	1	0	0	0	0	0	0	0.2	0.1
0700-0800	0	0	1	2	1	0	1	0.8	0.7
0800-0900	2	1	0	0	0	**1**	1	0.6	0.7
0900-1000	**2**	1	**2**	3	2	0	**4**	2.0	**2.0**
1000-1100	1	0	1	**7**	1	0	0	**2.0**	1.4
1100-1200	0	**1**	0	1	**4**	0	2	1.2	1.1
1200-1300	1	**2**	1	0	0	**7**	**3**	0.8	**2.0**
1300-1400	2	1	0	0	4	2	1	1.4	1.4
1400-1500	2	0	0	0	0	1	0	0.4	0.4
1500-1600	0	0	0	**2**	0	1	1	0.4	0.6
1600-1700	0	1	2	1	**4**	1	0	**1.6**	1.3
1700-1800	1	0	0	1	1	1	0	0.6	0.6
1800-1900	1	1	2	0	2	0	0	1.2	0.9
1900-2000	0	1	0	0	0	5	0	0.2	0.9
2000-2100	0	0	0	0	3	2	0	0.6	0.7
2100-2200	**4**	0	**2**	0	0	1	0	1.2	1.0
2200-2300	0	0	0	1	1	0	0	0.4	0.3
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	12	8	9	17	19	14	13	13.0	13.1
0600-2200	17	9	11	17	22	22	13	15.2	15.9
0600-0000	17	9	11	18	23	22	13	15.6	16.1
0000-0000	17	9	11	20	24	23	13	16.2	16.7
AM Peak	0900	1100	0900	1000	1100	0800	0900		
	2	1	2	7	4	1	4		
PM Peak	2100	1200	2100	1500	1600	1200	1200		
	4	2	2	2	4	7	3		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	02 Aug	03 Aug	04 Aug	05 Aug	06 Aug	07 Aug	08 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	0	1	0.0	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	**4**	0	0	0.8	0.6
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	1	0	0	0	0.2	0.1
0500-0600	1	1	0	0	0	0	0	0.4	0.3
0600-0700	0	0	0	3	1	0	0	0.8	0.6
0700-0800	1	2	2	4	0	0	0	1.8	1.3
0800-0900	2	1	1	**4**	2	2	1	2.0	1.9
0900-1000	**4**	**3**	**4**	0	3	0	0	**2.8**	**2.0**
1000-1100	0	1	1	1	1	0	0	0.8	0.6
1100-1200	2	0	1	1	2	**3**	**2**	1.2	1.6
1200-1300	0	1	3	0	2	1	2	1.2	1.3
1300-1400	**2**	0	0	1	0	2	2	0.6	1.0
1400-1500	0	**2**	1	**3**	3	0	0	1.8	1.3
1500-1600	0	1	1	2	3	2	2	1.4	1.6
1600-1700	0	1	**9**	1	1	0	0	**2.4**	**1.7**
1700-1800	1	0	2	2	**3**	0	**3**	1.6	1.6
1800-1900	1	1	2	2	0	**4**	0	1.2	1.4
1900-2000	1	0	1	1	1	3	1	0.8	1.1
2000-2100	0	0	2	1	1	1	0	0.8	0.7
2100-2200	0	0	1	1	1	0	1	0.6	0.6
2200-2300	1	0	0	0	0	0	0	0.2	0.1
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	13	13	27	21	20	14	12	18.8	17.1
0600-2200	14	13	31	27	24	18	14	21.8	20.1
0600-0000	15	13	31	27	24	18	14	22.0	20.3
0000-0000	16	14	31	28	28	18	15	23.4	21.4
AM Peak	0900	0900	0900	0800	0200	1100	1100		
	4	3	4	4	4	3	2		
PM Peak	1300	1400	1600	1400	1700	1800	1700		
	2	2	9	3	3	4	3		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	09 Aug	10 Aug	11 Aug	12 Aug	13 Aug	14 Aug	15 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	1	0	0	0	0.2	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	1	0	0	0	0.2	0.1
0500-0600	0	0	1	0	0	0	0	0.2	0.1
0600-0700	2	2	1	1	1	2	2	1.4	1.6
0700-0800	1	0	1	2	0	0	0	0.8	0.6
0800-0900	0	1	2	0	0	1	2	0.6	0.9
0900-1000	**4**	**2**	2	2	0	0	**3**	2.0	1.9
1000-1100	3	1	**2**	**3**	**2**	**2**	1	**2.2**	**2.0**
1100-1200	1	0	1	0	1	0	1	0.6	0.6
1200-1300	1	1	**3**	**4**	0	1	0	**1.8**	1.4
1300-1400	0	**3**	1	0	0	0	0	0.8	0.6
1400-1500	0	0	1	3	0	4	0	0.8	1.1
1500-1600	1	2	0	1	2	2	2	1.2	**1.4**
1600-1700	2	1	0	2	1	2	0	1.2	1.1
1700-1800	**2**	1	0	0	**2**	2	1	1.0	1.1
1800-1900	0	0	2	1	0	**4**	**2**	0.6	1.3
1900-2000	0	1	0	0	1	2	0	0.4	0.6
2000-2100	1	1	2	0	0	3	0	0.8	1.0
2100-2200	0	0	2	0	0	0	1	0.4	0.4
2200-2300	0	0	0	0	0	0	1	0.0	0.1
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	15	12	15	18	8	18	12	13.6	14.0
0600-2200	18	16	20	19	10	25	15	16.6	17.6
0600-0000	18	16	20	19	10	25	16	16.6	17.7
0000-0000	18	16	21	21	10	25	16	17.2	18.1
AM Peak	0900	0900	1000	1000	1000	1000	0900		
	4	2	2	3	2	2	3		
PM Peak	1700	1300	1200	1200	1700	1800	1800		
	2	3	3	4	2	4	2		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	16 Aug	17 Aug	18 Aug	19 Aug	20 Aug	21 Aug	22 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	1	0	0	0	0	0.2	0.1
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	1	1	0	0	0.4	0.3
0500-0600	1	0	0	0	0	0	0	0.2	0.1
0600-0700	1	0	0	0	0	0	0	0.2	0.1
0700-0800	1	2	0	2	**2**	0	0	1.4	1.0
0800-0900	0	4	0	2	0	1	0	1.2	1.0
0900-1000	3	**5**	**2**	0	1	**3**	0	**2.2**	**2.0**
1000-1100	2	1	0	**2**	0	0	1	1.0	0.9
1100-1200	**3**	0	1	0	1	1	**1**	1.0	1.0
1200-1300	1	2	0	0	2	0	2	1.0	1.0
1300-1400	1	1	0	0	3	0	1	1.0	0.9
1400-1500	**4**	0	0	2	4	2	**2**	2.0	2.0
1500-1600	0	3	2	3	**4**	0	1	2.4	1.9
1600-1700	2	**3**	1	**4**	2	5	0	**2.4**	**2.4**
1700-1800	1	1	**2**	0	1	**5**	0	1.0	1.4
1800-1900	0	0	1	1	0	2	1	0.4	0.7
1900-2000	2	1	0	1	0	1	0	0.8	0.7
2000-2100	1	0	1	0	0	0	0	0.4	0.3
2100-2200	0	0	0	2	0	0	0	0.4	0.3
2200-2300	0	0	0	1	1	0	0	0.4	0.3
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	18	22	9	16	20	19	9	17.0	16.1
0600-2200	22	23	10	19	20	20	9	18.8	17.6
0600-0000	22	23	10	20	21	20	9	19.2	17.9
0000-0000	23	23	11	21	22	20	9	20.0	18.4
AM Peak	1100	0900	0900	1000	0700	0900	1100		
	3	5	2	2	2	3	1		
PM Peak	1400	1600	1700	1600	1500	1700	1400		
	4	3	2	4	4	5	2		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-3
Site: 1.0.1SN
Description: **Calwynyardah - Noonkanbah Rd**
Filter time: **13:46 Monday, 19 July 2021 => 10:36 Wednesday, 25 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(ESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	23 Aug	24 Aug	25 Aug	26 Aug	27 Aug	28 Aug	29 Aug	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	*	*	*	*	0.0	0.0
0100-0200	0	0	0	*	*	*	*	0.0	0.0
0200-0300	0	0	0	*	*	*	*	0.0	0.0
0300-0400	0	0	0	*	*	*	*	0.0	0.0
0400-0500	0	0	0	*	*	*	*	0.0	0.0
0500-0600	0	0	0	*	*	*	*	0.0	0.0
0600-0700	0	0	0	*	*	*	*	0.0	0.0
0700-0800	0	0	0	*	*	*	*	0.0	0.0
0800-0900	1	0	0	*	*	*	*	0.3	0.3
0900-1000	2	0	0	*	*	*	*	0.7	0.7
1000-1100	3	0	0	*	*	*	*	1.0	1.0
1100-1200	**4**	**0**	*	*	*	*	*	**2.0**	**2.0**
1200-1300	2	0	*	*	*	*	*	1.0	1.0
1300-1400	1	**2**	*	*	*	*	*	1.5	1.5
1400-1500	**3**	0	*	*	*	*	*	**1.5**	**1.5**
1500-1600	0	0	*	*	*	*	*	0.0	0.0
1600-1700	0	0	*	*	*	*	*	0.0	0.0
1700-1800	0	0	*	*	*	*	*	0.0	0.0
1800-1900	0	0	*	*	*	*	*	0.0	0.0
1900-2000	0	0	*	*	*	*	*	0.0	0.0
2000-2100	0	0	*	*	*	*	*	0.0	0.0
2100-2200	0	0	*	*	*	*	*	0.0	0.0
2200-2300	0	0	*	*	*	*	*	0.0	0.0
2300-2400	0	0	*	*	*	*	*	0.0	0.0
Totals									
0700-1900	16	2	*	*	*	*	*	8.0	8.0
0600-2200	16	2	*	*	*	*	*	8.0	8.0
0600-0000	16	2	*	*	*	*	*	8.0	8.0
0000-0000	16	2	*	*	*	*	*	8.0	8.0
AM Peak	1100	1100	*	*	*	*	*		
	4	0	*	*	*	*	*		
PM Peak	1400	1300	*	*	*	*	*		
	3	2	*	*	*	*	*		

*** - No data.**

Appendix R. GHG Management Plan

Valhalla Gas Exploration and Appraisal Program

Greenhouse Gas Environmental Management Plan

BNR_HSE_MP_014

VERSION HISTORY				
Ver. No.	**Ver. Date**	**Author**	**Reviewer**	**Revision**
1	10 Jan 2022	AF	SR	For EPA submission
2	01 May 2023	AF,MLL	ML	For EPA submission
3	11 May 2024	MLL, AF	ML	For EPA submission
4	14 May 2024	MLL, SS		For Peer Review
5	7 June 2024	MLL, SS	ML	For EPA submission

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Acronym / abbreviation

Terms / acronym	Definition / expansion
ACCU	Australian Carbon Credit Units
API	American Petroleum Institute
bbl	Barrel, a unit of volume for crude oil and petroleum products
BNR	Bennett Resources Pty Ltd
CH_4	Methane
CNG	Compressed Natural Gas
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CO_2e/GJ	Carbon dioxide equivalent per gigajoule
e.g.	For example
EMP	Environmental Management Plan
EP 371	Exploration Permit 371
EP Act	*(WA) Environmental Protection Act 1986*
EPA	(WA) Environmental Protection Authority
ESD	Environmental Scoping Document
FullCAM	Full Carbon Accounting Model
FY	Financial year
GHG	Greenhouse Gas
GHGEMP	Greenhouse Gas Management Plan
GJ/kL	Gigajoule per kilolitre
ha	Hectare
HFS	Hydraulic Fracturing Stimulation
i.e.	That is
kg/m^3	Kilogram per cubic metre
kL	Kilolitres
km^2	Square kilometres
kWh	Kilowatt per hour
LNG	Liquified Natural Gas
m	Metres
m^3	Cubic metres
ML	Megalitres
MMscf/d	Million standard cubic feet per day
NGER	National Greenhouse and Energy Reporting
NOx	Nitrogen Oxides

Terms / acronym	Definition / expansion
N_2O	Nitrous Oxide
PV	Photovoltaic
Proponent	Bennett Resources Pty Ltd
Proposal	Valhalla Gas Exploration and Appraisal Program
tC/ha	Tonnes of carbon per hectare
tCO_2e	Tonnes of carbon dioxide equivalent
tCO_2e/ha	Tonnes of carbon dioxide equivalent per hectare
tCO_2/tCH_4	Tonnes of carbon dioxide equivalent per tonnes of Methane
tCO_2e/d	Tonnes of carbon dioxide equivalent per day
tpa CO_2-e	Tonnes of carbon dioxide equivalent per annum
US EPA	Environmental Protection Agency of the United States
WA	Western Australia
%	Percentage
~	Approximately

1 Executive summary

This Greenhouse Gas Environmental Management Plan (GHGEMP) has been prepared by Bennett Resources (BNR) to support the assessment, approval and implementation of the Valhalla Gas Exploration and Appraisal Program (the Proposal) under Part IV of the *Environmental Protection Act 1986* (EP Act).

Bennett Resources referred the Proposal to the Environmental Protection Authority (EPA) under Part IV of the EP Act on 24 December 2020 (EPA Assessment Number 2281). The EPA has decided to assess the Proposal at a level of Public Environmental Review.

This GHGEMP has been written in accordance with the "Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans" (EPA 2021a), the Greenhouse Gas Emissions Environmental Factor Guideline (EPA 2023) and the GHG EMP Template (EPA 2023). An executive summary of this GHGEMP is provided in Table 1-1.

Table 1-1: Executive summary of the GHGEMP

Proposal title	Valhalla Gas Exploration and Appraisal Program (EPA Assessment Number 2281)
Proponent name	Bennett Resources Pty Ltd
Proposal Description and Scope	The Proposal is to complete an unconventional exploration and appraisal drilling and hydraulic fracture stimulation (HFS) program on Petroleum Exploration Permit EP 371 in the Canning Basin.
Purpose of the GHGEMP	The purpose of this GHGEMP is to support the assessment, approval, and implementation of the Proposal under Part IV of the EP Act, and to provide management and monitoring actions for Greenhouse Gas (GHG) emissions resulting from the Proposal that are aligned with the intent of BNR's Climate Change Policy, and the Western Australian Government Climate Policy (WA Government 2020). Monitoring of greenhouse gas emissions will be undertaken in accordance with the Valhalla Monitoring Plan.
Emissions estimates	It is expected that the proposal will comprise scope 1 emissions only. During phase one, maximum emissions will be <200,000 tCO_2e/year During phase two, maximum emissions will be <600,000 tCO_2e/year A maximum emissions estimate for the full program is 1,603,293 tCO_2e.
Trajectory of emissions reductions	In alignment with BNR's Climate Change Policy (Appendix A) and the requirements of ESD Item 78, the long-term environmental outcome is to avoid, reduce, or mitigate 100% of scope 1 GHG emissions by 2050. This GHG EMP commits to avoid, reduce, or mitigate 43% of scope 1 GHG emissions by the end of year 5 (anticipated to be around 2030). No scope 2 or scope 3 emissions are expected to be produced through this proposal.
Other statutory decision-making processes which require reduction in GHG emissions	The trajectory of emissions, which is expected to reduce to zero after seven years from the commencement of the proposal, is consistent with the EPA's GHG objective to reduce net GHG emissions in order to minimise the risk of environmental harm associated with climate change, and with ESD item 78.
Key components in the GHEGEMP	The long-term environmental outcome for this GHGEMP is to avoid, reduce, or mitigate 100% of Scope 1 GHG emissions from the Proposal by 2050. This long-term outcome is supported by a single interim environmental outcome of the GHGEMP, to avoid, reduce, or mitigate 43% of Scope 1 GHG emissions from the Proposal by the end of the 5th year of the Proposal. These environmental GHGEMP outcomes and their associated indicators, response actions, monitoring and reporting requirements, are defined in Table 5-1 and Table 5-2.
GHGEMP reviews and reporting	This GHGEMP is intended to be dynamic and may be updated to reflect changes in management practices and the natural environment over time. It will be reviewed on a five-yearly cycle.
Proposed construction / commencement date	TBC – within Calendar Year 2025.

EMP required pre-construction / commencement?	Yes ☒ No ☐
Proposed project end of life/decommissioning date	TBC – within Calendar Year 2032

2 Context, scope and purpose

2.1 Proponent, Proposal Description and Scope

Bennett Resources Pty Ltd (BNR), a wholly owned subsidiary of Black Mountain Energy Pty Ltd, is the proponent for the Proposal.

The Proposal is to complete an unconventional exploration and appraisal drilling and Hydraulic Fracture Stimulation (HFS) program within Petroleum Exploration Permit EP 371 (EP 371) in the Canning Basin, within the Shire of Derby / West Kimberley in Western Australia (WA).

The intent of the Proposal is to evaluate the large tight gas resource in the region which has the potential to offer long-term energy security to Australia. The onshore Canning Basin is an early Ordovician to early Cretaceous aged geological basin that covers approximately 430,000 km^2 in the West Kimberley region. The Proposal is targeting hydrocarbons present from the Laurel through to the Devonian Formations, ranging from 2,000 m to 5,000 m below ground level. The main target is the Laurel Formation, with hydrocarbons present at depths between 2,000 m and 4,000 m below ground level.

Table 2-1 provides a summary of the Proposal.

Table 2-1: Summary of the Proposal

Proposal title	Valhalla Gas Exploration and Appraisal Program (EPA Assessment Number 2281)
Proponent name	Bennett Resources Pty Ltd (BNR)
Short description	The Proposal is to undertake an unconventional exploration and appraisal drilling program within EP 371, located in the Canning Basin, West Kimberley of Western Australia. The Proposal includes the construction of up to 20 exploration wells within 10 well sites. The intent of the Proposal is to further appraise the extent of the tight gas reservoir in the Laurel Formation with hydrocarbon shows present at depths in the order of 2,000 m to 4,000 m below ground level. The exploration and appraisal program is expected to commence in 2024 or 2025.
Purpose of the GHGEMP	To meet the Environmental Scoping Document (ESD) Item 78: *Provide a greenhouse gas management plan, in accordance with EPA guidance, which demonstrates the proposal's trajectory towards net zero emissions by 2050.* The goal of ensuring new zero emissions by 2050 is in line with the Western Australian Government's Climate Policy, released in November 2020, which commits the government to working with all sectors of the economy to achieve net zero greenhouse gas emissions by 2050.

2.2 Purpose of the GHGEMP

The purpose of this GHGEMP is to support the assessment, approval, and implementation of the Proposal under Part IV of the EP Act, and to provide management actions for Greenhouse Gas (GHG) emissions resulting from the Proposal that are aligned with the intent of BNR's Climate Change Policy, and the Western Australian Government Climate Policy (WA Government 2020). Monitoring of greenhouse gas emissions will be undertaken in accordance with the Valhalla Monitoring Plan.

The elements have been identified as having the potential to affect the Key Environmental Factor – Greenhouse Gas Emissions include:

- well testing (resulting in gas and condensate flaring)
- diesel fuel usage
- land clearing and fugitive emissions.

BNR has developed this GHGEMP to meet the Environmental Scoping Document (ESD) Item 78:

> *Provide a greenhouse gas management plan, in accordance with EPA guidance, which demonstrates the proposal's trajectory towards net zero emissions by 2050.*

The goal of ensuring new zero emissions by 2050 is in line with the Western Australian Government's Climate Policy, released in November 2020, which commits the government to working with all sectors of the economy to achieve net zero greenhouse gas emissions by 2050.

3 GHGEMP components

This section of the GHGEMP identifies the emissions estimates, trajectory of emissions reductions and mitigation measures adopted to avoid, reduce or offset emissions.

3.1 Emissions estimates

3.1.1 Scope 1 emissions

An emissions inventory of direct Scope 1 GHG emissions is provided in Table 3-1 The methodologies used to calculate this inventory are provided in Appendix B. As detailed in Appendix B, the main sources of Scope 1 GHG emissions are (per well):

- gas and condensate flaring, comprising up to approximately 88,428 tCO_{2-e} (or 93.1%) of Scope 1 GHG emissions
- diesel fuel usage, comprising up to approximately 3,300 tCO_{2-e} (or 6.3%) of Scope 1 GHG emissions
- land clearing and fugitive emissions, comprising up to approximately 337 tCO_{2-e} (or 0.6%) of Scope 1 GHG emissions.

Table 3-1: Scope 1 GHG inventory

CO2 emissions per exploration and appraisal well	Input parameter	Phase I – 6 wells (tCO_{2-e})		Phase II – 14 wells (tCO_{2-e})		Calculation reference
		~60 days flaring	~90[1] days flaring	~60 days flaring	~90 days flaring	
Flare (per well)						
Gas	Phase I: 5.9 mmscf/d Phase II: 10.7 mmscf/d	29,747	44,620	53,948	80,921	NGER Guidelines (Government of Australia 2008) Section 3.44
Condensate	Phase I: 118 bbl/d Phase II: 214 bbl/d	2,760	4,140	5,005	7,507	NGER Guidelines (Government of Australia 2008) Section 3.52
Diesel usage (per well)						
Site preparation	20	54	54	54	54	NGER Guidelines (Government of Australia 2008) Section 2.41 with Table in Schedule 1 Part 3.
Drilling operations	316	857	857	857	857	
HFS operations	510	1,382	1,382	1,382	1,382	
Site reinstatement	20	54	54	54	54	
Transport (vehicles/rigs)	344	931	931	931	931	
Site power	8	15	22	15	22	

[1] BNR has estimated that to collect the required data, the well must be flowed during the period of maximum gas concentration for up to 90 days.

CO2 emissions per exploration and appraisal well	Input parameter	Phase I – 6 wells (tCO_{2-e})		Phase II – 14 wells (tCO_{2-e})		Calculation reference
		~60 days flaring	~90[1] days flaring	~60 days flaring	~90 days flaring	
Land clearing (per well)						
Land clearing emissions	5.1 ha per well 56.3 tCO2-e/ha	287	287	287	287	FullCAM Model (Australian Government 2020)
Fugitive emissions (per well)						
Drill cuttings	Gas 0.12 tonnes	30	30	30	30	Based on volumes of drill cuttings and Valhalla gas saturation
Waste water	2 ML produced formation water	20	20	20	20	API GHG Emissions Methodologies for Oil and Gas (API 2009)
Total GHG emissions per well (tCO2-e)		**36,136**	**52,936**	**62,582**	**92,065**	**Scope 1 (direct emissions)**
Total emissions exploration and appraisal program (tCO_2-e)	Phase I–6 wells Phase II–14 wells	216,814	314,378	876,144	1,288,915	Scope 1 (direct emissions)

To understand annualised emissions totals, an emission timeline has been developed for the Proposal. This is based upon the assumption that Phase I will take three years and Phase 2 will take an additional four years. Figure 3-1 provides annual GHG emission forecasts for the Proposal.

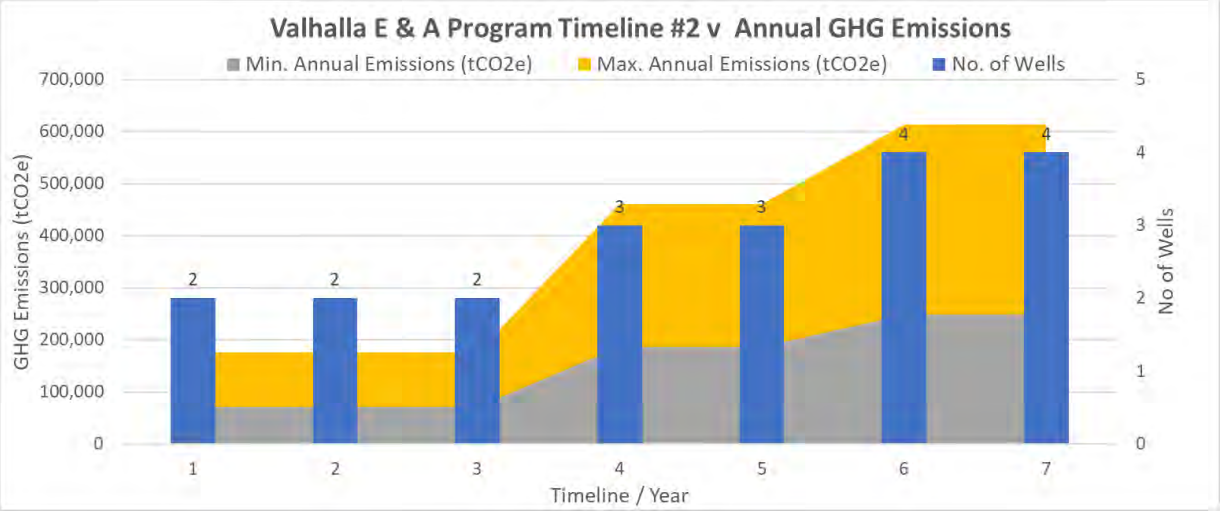

Figure 3-1: Timeline for overall scope 1 GHG emissions of the Valhalla E&P Program

3.1.2 Scope 2 emissions

As the Proposal does not intend to import power from third parties, no Scope 2 emissions are expected.

3.1.3 Scope 3 emissions

Although no Scope 3 emissions are expected, BNR is maintaining the possibility of selling condensate collected during the well test program to third parties as a recommended GHG mitigation measure. Through the implementation of this mitigation, BNR would avoid emissions associated with flaring of condensate during well testing. The quantity of Scope 3 emissions associated with the transportation and utilisation of condensate as a fuel was calculated on the basis that all condensate produced from the well tests for a maximum 90-day test period was captured and transported to Singapore via Wyndham where it was assumed to be processed and consumed. The Scope 3 emission inventory is provided as Table 3-2.

Table 3-2: Scope 3 GHG inventory

Scope 3 emissions per well	~60 days flaring	~90 days flaring
Condensate Volume (bbls)	222,240	333,360
Condensate Transport Emissions (tCO_2e)	13,952	20,928
Condensate Consumption Emissions (tCO_2e)	91,571	137,356
Total Scope 3 Emissions (tCO_2e)	105,523	158,284

3.2 GHG emissions benchmarking

As required under ESD Item 77, BNR completed an emissions benchmarking assessment to understand how the Proposal compares to other HFS projects. Specifically, BNR benchmarked the Proposal emissions against the following projects:

- Buru – Canning Basin – TGS14 Project
- Origin – Betaloo Basin – Valkerri Project
- Origin – Betaloo Basin – Kyalla Project
- Santos – McArthur Basin EP161 Project
- Imperial – McArthur Basin – Carpinteria 1.

In order to benchmark projects for their GHG emissions, typically, GHG emissions intensity values are calculated on a 'tCO_2e per tonne of product' basis for manufacturing projects or 'tCO_2e per kWh' basis for power generation projects such that project emissions can be compared. GHG emission intensities from gas exploration projects can be compared on both a 'per well per test day' and 'per well test' basis to benchmark the Proposal.

GHG emissions intensities on a 'per well per test day' basis for the Proposal is shown in Figure 3-2. The results indicate more emissions from the Valhalla well tests per day are expected due to the higher well test flow rates per day.

It should be noted that the Origin and Santos test programs are planned for a significantly longer period, up to 12 months compared to 2-3 months for the Valhalla Gas Exploration and Appraisal Proposal. Therefore, another comparison was made based on the planned minimum and maximum total emissions per well. Figure 3-3 provides planned total emissions per well. The results indicate that wells associated with Phase I of the Proposal are comparable with the permitted / planned total emissions of other projects in the Beetaloo Basin in the Northern Territory. Phase II wells from this Proposal are higher than the other projects due to their potentially higher flow test rates.

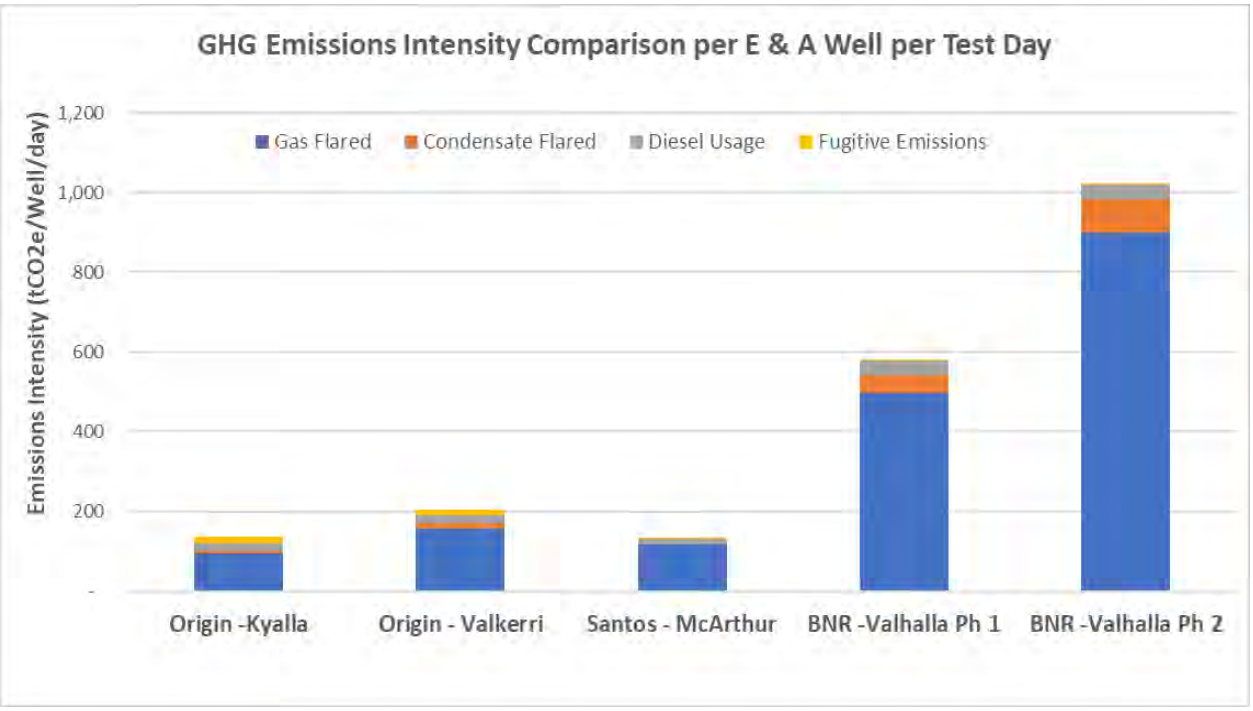

Figure 3-2: Benchmarking GHG emissions of the Valhalla Gas Exploration and Appraisal Program per well per test day

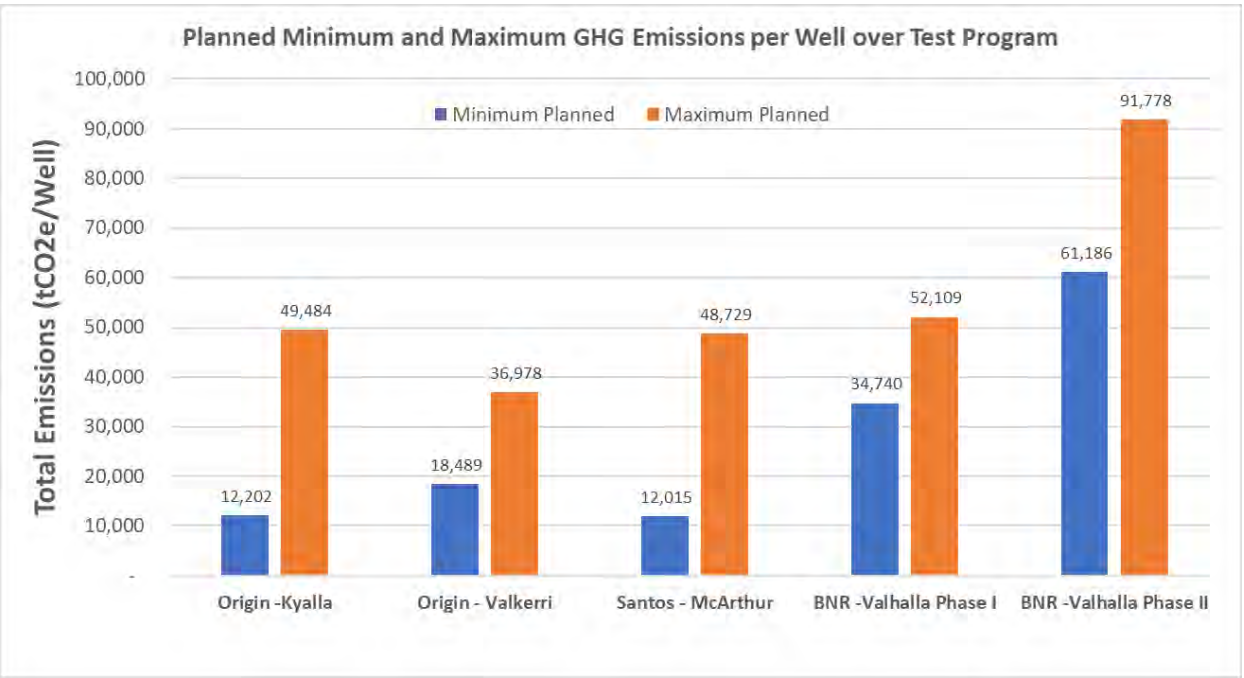

Figure 3-3: Benchmarking GHG emissions of the Valhalla Gas Exploration and Appraisal Program for planned total emissions per well

.

3.3 Trajectory of emissions reductions

BNR considers the use of an outcome based GHGEMP appropriate as GHG emissions can be, and are required to be, measured and/or quantified. Monitoring of GHG emissions will enable BNR to inform future field plans whilst demonstrating if interim and long-term environmental outcomes have been met. Given the nature of the Proposal which is limited to a seven-year exploration program, BNR plans to use the information gathered during this to inform GHG abatement opportunities for future field development.

In alignment with BNR's Climate Change Policy (Appendix A), the Western Australian Climate Policy (DWER 2020) and the requirements of ESD Item 78, the long-term environmental outcome for this GHGEMP is to avoid, reduce, or mitigate 100% of Scope 1 GHG emissions by 2050.

To support this long-term environmental outcome, the following interim outcome has been defined for this GHGEMP: to avoid, reduce, or mitigate 43%[2] of Scope 1 GHG emissions by the end of the year five (Figure 3-4).

On the basis that this GHGEMP will be reviewed on at least a five-yearly cycle (Section 7), the interim and long-term environmental outcomes are considered appropriate to meet BNR's and the State government's targets to achieve net zero emissions by 2050.

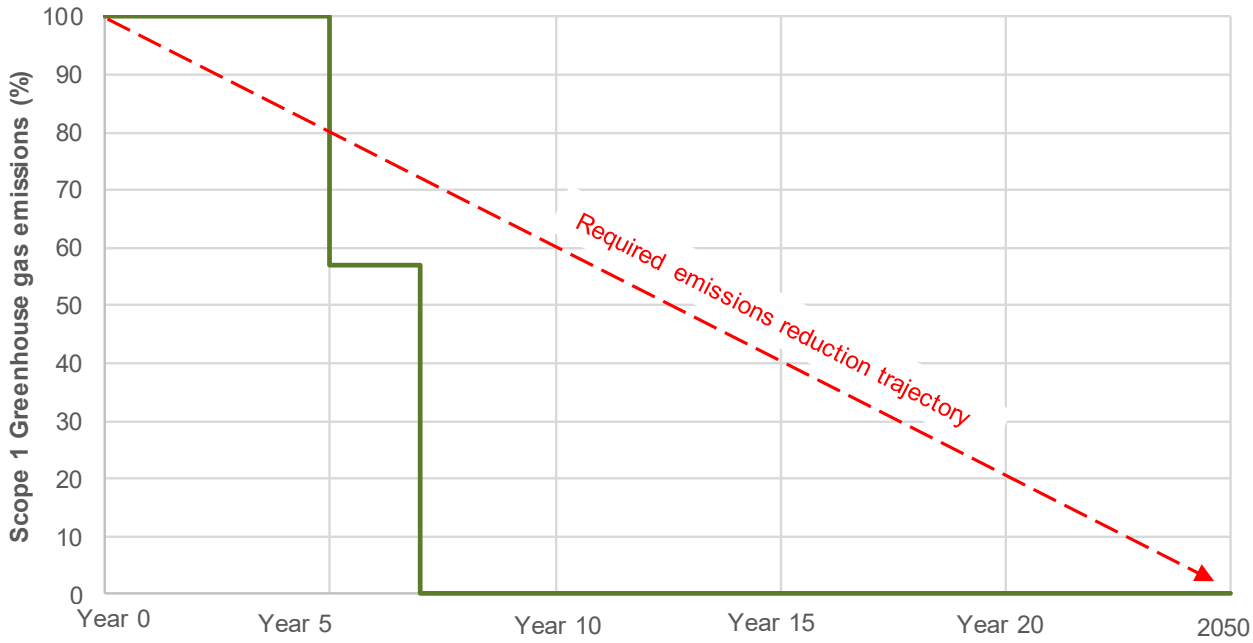

Figure 3-4: GHGEMP environmental outcomes for the Proposal

[2] Australia was a signatory to the Paris Agreement, which entered into force in 2016, and committed to reducing GHG emissions by 26–28% below 2005 levels by 2030. Subsequently, the Climate Change Bill, which passed the Senate in 2022, sets Australia's greenhouse gas emissions reduction targets at a 43% reduction by 2030 and net zero by 2050. Consequently, BNR has updated the interim GHG target with the emission reduction requirements set by the Climate Change Act.

3.4 Mitigation measures adopted to avoid, reduce or offset scope 1 emissions

3.4.1 Consideration of the mitigation hierarchy

In line with the EPA's mitigation hierarchy for GHG emissions (avoid, reduce, or offset) (EPA 2021b), BNR has identified and assessed a range of emission mitigation opportunities. This assessment was facilitated by an independent GHG emissions consultant. The summary of the options and outcomes of the assessment are provided in Table 3-3.

Table 3-3: Emission avoidance and reduction

Option	Description	Estimated tCO2e mitigated for the Proposal	Mitigation hierarchy	Supporting details	Outcome
Well design – Horizontal vs Vertical	Single well pad vertical designs result in significantly more land clearing given the land required to install a single well is the same as that required for multiple wells. The use of efficient multi-well pad horizontal shale development results in a 50%-60% reduction in land use.	2,300 tCO_2e	Avoid	The Valhalla Exploration and Appraisal program utilises 10 well pads for drilling 20 wells, implementing an efficient multi-well drilling technique to minimise land clearing. The minimisation of land clearing reduces the impact associated with GHG emissions associated with the removal of vegetation. A total land cleared for the 20 well program is <110 ha of which 40 ha is associated with the well sites, therefore reducing overall land cleared by around 40%.	Selected
Flaring vs Venting	Gas flaring is carried out in accordance with Code of Practice requirements and as per US EPA 40 Code of Federal Regulations 63.11, with a flare tip combustion efficiency of 98%. Flaring converts methane to carbon dioxide and water, thus significantly reducing methane emissions. Carbon dioxide has a global warming potential 25 times lower than methane over a 100-year span, therefore the removal of methane is preferable.	10,000 tCO_2e	Avoid	Gas venting is avoided during the well completions and well tests and only permitted for operational or safety reasons. Two separate vertical stacks, one for flowback high pressure gas and a second low pressure flare to manage tank vapours (off storage tanks) would be used to ensure all methane at site is flared.	Selected
Selection of efficient diesel generators	The Tier 4 diesel engines have 90% lower NOx and particulate matter emissions compared to Tier 3 engines and are fuel efficient resulting 15% GHG emissions reduction.	25,000 tCO_2e	Reduce	BNR will utilise the latest efficient units with highest emission standards for the Proposal. Specifically, these are currently industry best practice.	Selected
Condensate capture for sale or other use	The well test fluids during the exploration and appraisal program could be passed via a sand trap and 3-phase separator to remove water and condensate from the gas where the condensate could be stored and trucked out of site for sale to a refinery.	129,943 tCO_2e	Avoid	BNR is currently evaluating options for the sale of condensate produced from the well tests via Wyndham Port to Singapore, where Buru Energy already exports its oil.	Under consideration
Renewables (power generation)	The use of renewable energy such as solar photovoltaic (PV) for powering the drilling and HFS activities are impracticable because of	19,740 tCO_2e	Avoid	The solar PV power also needs to be supported with large batteries that can store energy to be supplied during the nights, therefore resulting in significantly higher costs. Furthermore, the rigs and HFS units need to be re-located to various sites	Not considered for use

Option	Description	Estimated tCO2e mitigated for the Proposal	Mitigation hierarchy	Supporting details	Outcome
	the finite period of drilling, and the requirement for continuous drilling.			during the drilling program which will make the use of renewable energy impracticable. A better alternative would be to use grid power, if available, for drilling, while the grid is supported by renewable power. The Canning Basin and Valhalla region do not have such a grid to support the project.	
Renewables (lighting towers)	The use of solar powered lighting units reduces the emissions associated with diesel powered towers.		Avoid	Solar powered lighting towers with battery backup are planned to be used in the project as shown along with other solar power based instrumentation and monitoring systems.	Selected
Gas capture for sale or other use	The Canning Basin does not have any gas infrastructure such that the flow test gas can be treated and sent to a gas pipeline for sale. Therefore, the only possibility would be to capture the gas as Compressed Natural Gas (CNG) or utilising micro Liquified Natural Gas (LNG) facilities and supply it to energy users				
Compressed Natural Gas	The well test gas would be required to be dehydrated and compressed to around 250 bar to be stored in high pressure storage bullets which can then be used in gas engines for power generation in well test sites instead of diesel.	1,398,814 tCO_2e	Avoid	CNG can also be transported to power stations in Broome, Derby and other west Kimberley towns to replace LNG trucked from Karratha at present. CNG could also be used in dual-fuel engines for the drilling and HFS within the Valhalla Gas Exploration and Appraisal Program if equipment with suitable engine specifications is available locally. At present the sale of gas as CNG is considered unviable due the associated cost of capture, treatment and transportation to markets located far from the Valhalla field.	Not selected for use
Micro LNG	A relocatable micro LNG plant could also be used to capture the well head gas (as used in some US shale gas operations) if this equipment were available in the Australian market. The use of micro LNG option would require the well head gas to be pre-treated such that water, CO_2 and freezable heavy hydrocarbons are removed from the gas to allow liquefaction of the gas.			LNG produced can be stored in transportable International Organization for Standardization containers and shipped to markets. CryoboxTM is a micro LNG technology, and other similar flare gas liquefaction technologies that provide relocatable pre-treatment units as used in the US shale gas industry. At present, the sale of LNG to local power stations is considered unviable with existing gas offtake contracts in place with power plant operations and the inability for the project proponents to commit to a fixed volume based on LNG supply contracts from the gas exploration and appraisal program.	Not selected for use

3.4.2 Key assumptions and uncertainties

Table 3-4 details the key assumptions and uncertainties that BNR has identified with respect to the proposed approach to managing GHG emissions.

BNR has proposed environmental outcomes, and associated monitoring and response actions, in consideration of the current state of GHG policies and available technical advice. An adaptive management approach has been proposed that allows for changes to this GHGEMP if required in the future to remain aligned with contemporary policies and scientific advice.

Table 3-4: Assumptions and uncertainties

Assumptions and uncertainties	Comment
Emission estimates	As the Proposal is an exploration and appraisal project, the quantity of emissions estimates is based upon a historic understanding of the Laurel Formation in EP 371. The nature and quantity of emissions may differ to the estimations provided given the purpose of the Proposal is to further understand and evaluate the Laurel Formation.
State and Commonwealth GHG policies	State and Commonwealth government policies and targets continue to evolve.
Market price carbon emissions	At this current time, there is no uniformly applied (i.e. on unit of carbon emitted) market price for carbon emissions (i.e. a carbon levy) within Australia.

3.5 Mitigation measures adopted to avoid, reduce or offset scope 2 emissions

This proposal will not produce scope 2 emissions, so mitigation measures are not required

3.6 Mitigation measures adopted to avoid, reduce or offset scope 3 emissions

Scope 3 emissions are not expected to be produced at this time. However, one of the mitigation measures being considered to reduce scope 1 emissions is to sell condensate through Wyndham to Singapore. This measure would produce more emissions overall (see Table 3 2, above), however would reduce scope 1 emissions. This project has no measures to mitigate scope 3 emissions other than a commitment to adopt best practice, should scope 3 emissions occur due to the sale of condensate.

3.7 Other statutory decision-making processes which require reduction in GHG emissions

The emissions reduction targets as specified in the Climate Change Bill have been considered and adopted within this GHGEMP.

3.8 Consistency with other GHG reduction tools

This GHGEMP is consistent with BNR's climate change policy.

3.9 Offsets

3.10 Overview

Following the mitigation hierarchy, GHG emissions should preferentially be managed via avoidance or reduction measures. However, where further reductions are required, carbon offsets will be considered as a mitigation option. This may include both Australian and international carbon offsets.

BNR acknowledges that carbon offsets may be necessary to meet the environmental outcomes defined within this GHGEMP. Where and when required, BNR will acquire carbon offsets that meet the contemporary Australian acceptability standards (e.g., they should meet offset integrity principles and be based on clear, enforceable, and accountable methods).

At the time of writing, acceptable Australian carbon offsets may include:

- Australian Carbon Credit Units (ACCUs) issued under the Commonwealth Carbon Credits (Carbon Farming Initiative) Act 2011
- eligible offsets under the standard Climate Active Carbon Neutral Standard for Organisations (Climate Active 2020), in addition to ACCUs include:
    - verified emission reductions issued under the Gold Standard
    - verified carbon units issued under the Verified Carbon Standard
    - certified emissions reductions issued as per the rules of the Kyoto Protocol from Clean Development Mechanism projects
    - removal units issued by a Kyoto Protocol country on the basis of land use, land use change and forestry activities under Article 3.3 or Article 3.4 of the Kyoto Protocol.

Many offset projects also deliver social, economic, or environmental outcomes in addition to emission reductions (Climate Active 2019).

3.11 Preferred Offsets and Availability

In the event annual Scope 1 GHG emissions exceed 43 % of the estimated baseline emissions by the end of the 5th year of operations, the purchase of appropriate offsets will be undertaken to reach this outcome. Given the expected GHG emissions for phase one of the project are 52,936 tCO_2e per well, and for phase two 92,065 tCO_2e (Table 3-1), the expected maximum carbon offsets needed, after the fifth year of operations, would be 22,763 tCO_2e/well in phase one, and 39,588 tCO_2e/well in phase two.

BNR expects that ACCUs would be the offsets most likely to be applied to the Proposal, if required, and is confident that sufficient availability will exist. In 2023, 17.2 million ACCUs were issued by the Clean Energy Regulator, with at least 20 million ACCUs expected to be issued in 2024 (CER 2024).

The fastest growing types of ACCU projects are human induced regeneration (HIR) projects which more than doubled between 2022 and 2023, and reforestation projects which increased by 38% over the same period.

3.12 Projects operating beyond 2050

This proposal is expected to be completed within seven years of its commencement, so will not be in operation in 2050.

4 Adaptive Management, Continuous Improvement and Review of the GHGEMP

A monitoring program (as described in Table 5-1 and Table 5-2, and in the Valhalla Monitoring Plan) is required to measure the effectiveness of the response actions as defined in this GHGEMP. The outcomes of the monitoring program will contribute to ongoing improvements in response actions to ensure an adaptive management approach is adopted.

BNR will implement an adaptive management framework that allows BNR to adapt and implement improvements as a result of monitoring against trigger and threshold criteria detailed in this document.

The following approaches will apply:

- monitoring data will be systematically evaluated
- the effectiveness and relevance of trigger level and threshold contingency actions will be evaluated to determine if any changes to response actions are required
- increased understanding of the hydrogeological regimes based on additional internal and external studies will be incorporated into the monitoring and management approach when newer relevant information becomes available where applicable.

Adaptive management practices that will be assessed as part of this approach may include:

- evaluation of the monitoring program, data and comparison to baseline data and reference sites on an annual basis to verify whether responses to project activities are the same or similar to predictions
- evaluation of assumptions and uncertainties of the management and monitoring program
- re-evaluation of the risk assessment and revision of risk-based priorities as a result of monitoring outcomes
- review of data and information gathered over the review period that has increased understanding of site environment in the context of the regional ecosystem
- assessment of changes which are outside the control of the project and the response actions identified.

5 Reporting

This section of the GHG EMP identifies the legal provisions (components) that BNR will implement to ensure that the environmental outcomes are met during implementation of the Proposal.

In accordance with the guideline “Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans” (EPA 2021), this section identifies the indicators that will be used to measure performance and the monitoring that will be undertaken in relation to these indicators. It defines the response actions (trigger level and contingency actions) that will be undertaken if the indicators are exceeded.

Table 5-1 and Table 5-2 detail the components of this GHGEMP for each of the interim and long-term environmental outcomes.

BNR will report annually and will make reports publicly available on its website.

Table 5-1: GHG EMP components – Interim 1 environmental outcome

EPA factor/s and objective/s	GHG Emissions – To reduce net GHG emissions to minimise the risk of environmental harm associated with climate change			
GHG EMP outcome/s	Interim 1: To avoid, reduce, or mitigate 28% of Scope 1 GHG emissions from the Proposal by the end of the 5th year of operations			
Key environmental values	**Carbon budget**			
Key impacts and risks	Contribution to Western Australia's GHG emissions, contribution to climate change and the risks to the environment from climate change			
Indicators	Response actions	Monitoring	Timing and Frequency	Reporting
Trigger criteria Annual Scope 1 GHG emissions from the Proposal are above the estimated baseline emissions: • Phase I (>52,936 tonne per well CO_2-e). • Phase II (>92,065 tonne per well CO_2-e).	**Trigger level action** If annual Scope 1 GHG emissions are above the estimated baseline emissions, then an investigation into the cause of the increased emissions will be undertaken and completed within the subsequent 12-month period and corrective actions implemented.	**Indicator** Scope 1 GHG emissions. **Method** GHG emissions will be monitored via various means including diesel inventories and flow meters.	• Diesel inventories will be maintained for all well sites on an annual basis. • Quantity of GHG associated with flaring activities will monitored continuously. • Total Scope 1 GHG emissions will be calculated annually (based on financial year schedule) during operations.	Routine reporting – Annual Compliance Assessment Report to the DWER Compliance Brach Exceedance reporting to DWER Compliance Branch – exceedance of the threshold criteria and contingency actions that have been implemented – within 5 days.
Threshold criteria Annual Scope 1 GHG emissions from the Proposal are not 43% below the estimated baseline emissions by the end of the 5th year of operations. • Phase I (>30,174 tonne per well CO_2-e). • Phase II (>52,477 tonne per well CO_2-e).	**Threshold contingency actions** If annual Scope 1 GHG emissions are not 43 % below the estimated baseline emissions by the end of the 5th year of operations, then: • within the subsequent 6-month period, net emissions for the Proposal will be decreased by the purchase of appropriate offsets to reduce Scope 1 emissions to at or below 57% of the estimated baseline emissions • net emissions for the Proposal will be maintained at or below 57 % of the estimated baseline emissions (by reductions or offset purchases) until the Proposal is complete.			

Table 5-2: GHG EMP components – Long-term environmental outcome

EPA factor/s and objective/s	GHG Emissions – To reduce net GHG emissions to minimise the risk of environmental harm associated with climate change			
GHG EMP outcome/s	Long-term: To avoid, reduce, or mitigate 100% of Scope 1 GHG emissions from the Proposal by 2050			
Key environmental values	**Carbon budget**			
Key impacts and risks	Contribution to Western Australia's GHG emissions, contribution to climate change and the risks to the environment from climate change			
Indicators	Response actions	Monitoring	Timing and Frequency	Reporting
Threshold criteria Annual Scope 1 GHG emissions from the Proposal are not 43% below the estimated baseline emissions by the end of the 5th year of operations. • Phase I (>30,174 tonne per well CO_2-e). • Phase II (>52,477 tonne per well CO_2-e). Methane levels above the detection limit (i.e. the laboratory LOR) of 3.3 mg/m^3 following the completion of the Proposal.	**Threshold contingency actions** If annual Scope 1 GHG emissions are not 100 % below the estimated baseline emissions by FY 2050 of operations, then: • within the subsequent 6-month period, net emissions for the Proposal will be decreased by the purchase of appropriate offsets to reduce Scope 1 emissions to at or below 0 tpa CO_2-e • net emissions for the Proposal will be maintained at 0 tpa CO_2-e (by reductions or offset purchases) for the life of the Proposal. If methane levels above the detection limit (i.e. the laboratory LOR) of 3.3 mg/m^3 are recorded following the completion of the Proposal, implementation of contingency measures will occur within 30 days of the exceedance including: • identify the reason for the exceedance and determine direct correlation to well site fugitive gas emissions, existing land use, or natural variation and review management measures with an adaptive management response • re-examine monitoring results (QA/QC) to validate data. • where the exceedance was not caused by the assets, no further action required • where the threshold exceedance can be attributed to the assets, implement adaptive management response that may include investigating assets to confirm if gas leakage is occurring and determine how leakage can be remediated, remediate assets to prevent further gas leakage and fugitive emissions, continue sampling/monitoring post remediation until at least two consecutive results reflect no significant deviation from ambient (baseline) samples.	**Indicator** Scope 1 GHG emissions. Methane emissions **Method** GHG emissions will be monitored via various means including diesel inventories and flow meters. In accordance with the Valhalla Monitoring Program, methane levels will be sampled at each well site using 24-hour air canisters. The location of methane emission monitoring will be based upon the location of the potential fugitive methane emissions arising post-activity.	• Diesel inventories will be maintained for all well sites on an annual basis. • Quantity of GHG associated with flaring activities will be monitored continuously. • Total Scope 1 GHG emissions will be calculated annually (based on financial year schedule) during operations. • Biennial methane sampling (pre-impact and post activity) at each well	Routine reporting – Annual Compliance Assessment Report to the DWER Compliance Brach

6 Stakeholder consultation

Consistent with the EPA's expectations for this GHGEMP to align with the principles of environmental impact assessment, BNR consulted with stakeholders during the development of the EPA referral. Engagements relevant to this GHGEMP are presented below in Table 6-1.

Table 6-1: Stakeholder engagement relevant to this GHGEMP

Stakeholder	Method of engagement	Date of engagement	Summary of engagement
EPA	Meeting	24 Nov 2021	Discussed the Environmental Management Plan (EMP) guidelines and new structure.
EPA	Email correspondence	8 May 2024	GHG EMP guidelines and new structure

For a full summary of stakeholder engagement records refer to the BNR Environmental Review Document (BNR_HSE_MP_013).

Any additional consultation regarding this GHGEMP will be captured in subsequent revisions.

7 Changes to GHGEMP

This GHGEMP is intended to be dynamic and may be updated to reflect changes in management practices and the natural environment over time. It will be reviewed on a five-yearly cycle. This approach will allow flexibility to adopt new approaches / management measures. The effectiveness and relevance of trigger level and threshold contingency actions will be evaluated on an annual basis, and any amendments to response actions will be completed on an as-needed basis. This will include:

- amendment of response actions that are not achieving the desired outcomes
- monitoring that identifies additional impacts requiring additional response actions or changes to existing response actions
- changes to relevant legislation that may affect the implementation of response actions
- improvements to management practices to achieve a greater environmental outcome
- updates to trigger and threshold criteria following the completion of baseline sample collection prior to commencing any groundwater extraction.

Specifically, a table summarising the changes following the template provided as Table 7-1 will be developed. This table will clearly indicate location and reason/s for changes. A tracked change version of the revised GHGEMP will be provided for all minor, non-structural changes to the document.

Table 7-1: GHGEMP review template

Complexity of changes	Minor revisions ☐		Moderate revisions ☐		Major revisions ☐
Date revision submitted to EPA	DD/MM/YYYY				
Is the change proposed to be implemented under condition C3-3? If so, the proponent must provide a copy to the CEO at least 20 days before commencing implementation			Yes ☐		No ☐
Proponent's operational requirement timeframe for approval of revision	< One Month ☐		< Six Months ☐	> Six Months ☐	None ☐
Reason for Timeframe					

Item number	GHGEMP section number	GHGEMP page number	Summary of change	Reason for change	New or increased adverse impacts to the environment? Risk to the achievement of limits, outcomes or objectives?
1.					
2.					
3.					

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Appendix A BNR Climate Change Policy

CLIMATE CHANGE POLICY

Black Mountain Exploration (BME) is committed to achieve the best possible balance between economic development and protection of the environment.

BME acknowledges the scientific consensus on climate change and the diverse effects that climate change may have on its customers, businesses, the economy and the communities in which it operates.

BME recognises that business has an important role to play in addressing climate change, and that its actions may deliver economic, social and environmental benefits over the long term. BME is committed to proactively managing the risks and to realising business opportunities associated with climate change. This policy applies to all BME activities.

BME will achieve net zero by 2050 by:

- Identifying opportunities to reduce Scope 1, 2 and 3 emissions through investments in research and technology, alternate energy sources, transport efficiency and process optimisation;
- Identifying and prioritising opportunities to leverage existing proven technology in renewable energy to reduce carbon emissions from power consumption;
- Exploring opportunities to minimise our consumption and contribution to waste;
- Adopting technology improvements as they become available and reasonably practicable to apply;
- Continuing to assess the acquisition or development of projects that have the potential to contribute to decarbonisation locally and globally (including offsets);
- Wherever possible and practicable, driving BME's emissions per unit of production below the mean of comparable peers;
- Being an active participant in various industry working groups; and
- Ensuring adequate resources are available to implement this policy including developing a broad ranging education and awareness campaign for our workforce and developing measures that will help guide our progress.

BME will strive to protect the environment and create sustainable businesses for future generations.

It is the responsibility of all employees, contractors and suppliers to comply with the requirements of this policy.

It is the responsibility of managers and supervisors to ensure this policy is implemented, reinforced and maintained through active leadership.

Samantha Richardson
Chief Operating Officer
Black Mountain Exploration Pty Ltd
28 June 2021

Revision date:
28 June 2022

Appendix B GHG Inventory Methodology

VALHALLA GAS EXPLORATION PROGRAM
GHG MANAGEMENT REPORT

REPORT PREPARED TO SUPPORT ENVIRONMENTAL REVIEW DOCUMENT WA EPA

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JULY 23, 2021

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Executive Summary

The Valhalla Gas Exploration and Appraisal Program (Proposal) was referred to the EPA by Bennett Resources (BNR) under section 38 of the WA Environmental Protection Act 1986 (EP Act) on 24 December 2020. The EPA determined that the Proposal should be assessed under Part IV of the EP Act at the level of assessment of Public Environmental Review on 3 February 2021.

As part of the review the EPA has provided a draft Environmental Scoping Document that requires the Proposal EIA documentations to include detailed estimates of greenhouse gas emissions (Scope 1, Scope 2 and Scope 3), a benchmarking exercise comparing emissions from the Proposal to other similar exploration and appraisal projects, along with a GHG emissions reduction assessment for the Proposal. NimblEng Energy Consultants were contracted by BNR to complete these tasks such that it can form part of the GHG Management Program for the EPA submission. The GHG emissions estimations were carried out based on updated Proposal information. The key changes compared to the 2020 Referral relates to the following which has led to a marked increase in GHG emissions:

- introducing options to the time period for the two proposed phases, with Phase I consisting of 6 wells drilled over 1-3 years and Phase II consisting of 14 wells drilled over 2-4 years;
- the proposed Well Test rate was increased from 2.5 mmscf/d to 5.9 mmscf/d for the Phase I wells and 10.7 mmscf/d for Phase II for the test period of 60-90 days per well;
- the condensate production was estimated based on condensate to gas ratio of 20 bbls/mmscf resulting in 118 bbl/d in Phase I and 214 bbl/d in Phase II during well testing.

Direct GHG emissions sources from the Proposal (Scope 1) were categorized into the following:

- Land clearing;
- Diesel fuel usage;
- Fugitive emissions; and
- Well Test gas flaring.

GHG emissions from each category was estimated based on accepted methodologies used by the WA EPA and EPA NT for exploration and appraisal projects involving hydraulic fracture stimulation (HFS). The GHG emissions were calculated based on a per well, per day rate and then total emissions were estimated based on the minimum and maximum number of Well Test days. The variable nature of drilling campaigns in an exploration and appraisal program does not allow the project proponents to commit to fixed annual emission rates rather, provide a range of estimated emissions based on the drilling program envisaged. The success of the Phase I program is key to the continuation of the Phase II drilling campaign. Therefore, annual emissions estimates are provided as a 3-year program (Timeline #1) and a 7-year program (Timeline #2) with the minimum and maximum emission each year. The total GHG emissions range from 1,082,000 to 1,592,600 tCO_2e over the 20-well exploration and appraisal program.

A benchmarking exercise comparing direct emissions from the Valhalla Proposal along with three recently approved HFS based exploration projects in the NT was carried out. The results indicate the total emissions from these projects are comparable with Phase I of the Valhalla project, but Phase II emissions remained high due to the higher well test rates planned for the Valhalla Proposal.

GHG Emissions Reduction Assessment for the Proposal was based on number of RECs (Reduced Emissions Completions) proposed by the WA Scientific Inquiry into Fracking and the Code of Conduct in NT. The key focus of the emissions reduction relates to the capture and utilisation of the well test gas and condensate produced. The project proponents are currently evaluating options to export the condensate from the drilling program and capture part of the gas and utilise it in dual fuel engines on site to power the drilling and HFS operations.

In line with meeting the state NetZero 2050 target, the WA EPA has set a NetZero emissions trajectory to reduce or offset emissions on a year-on-year basis for new projects with annual emission of more than 100,000 tCO2e. This report provides a quantitative estimate of GHG emissions that could be considered as above the NetZero 2050 trajectory for the Proposal that would be required to be offset by the proponents. Depending on how the EPA would assess the Valhalla exploration and appraisal program, the Proposal may or may not be required to offset carbon emissions due to the exploratory nature of the Proposal.

1 Background

The Valhalla Gas Exploration and Appraisal Program (Proposal) is located approximately 51 km Northwest of the townsite of Fitzroy Crossing (Shire of Derby-West Kimberley) in the Canning Basin Region in the State of Western Australia. It is located within the Petroleum Lease EP 371. Bennett Resources wholly owns the exploration lease which encompasses the proposed Valhalla Gas Exploration and Appraisal Program in its entirety[1].

The Proposal is to complete an unconventional gas exploration and appraisal drilling and Hydraulic Fracture Stimulation (HFS) program within Petroleum Exploration Permit EP 371 (EP 371). The Proposal includes the construction of up to 20 exploration wells within 10 well sites and is expected to commence in 2023 or 2024. The exploration program will be carried out in two phases where 6 wells will be drilled in the initial phase and based on the results the next 14 wells will be drilled in the second phase of the program.

On 24 December 2020, the Proposal was referred to the Environmental Protection Authority (EPA) under Section 38 of the Environmental Protection Act 1986. The Chairman of the EPA determined that the Proposal was required to be assessed via a Public Environmental Review. Subsequently, the EPA Services drafted an Environmental Scoping Document (ESD), which is yet to be finalised. The draft ESD provides details on the requirements to conduct GHG estimates (scopes 1, 2 & 3) and an Emissions Reduction Assessment for the Proposal. The assessment will inform (and be presented in) the Valhalla Environment Review Document (ERD)and GHG Management Plan (GHGMP).

1.1 Study Objective

The aim of this study is to provide a Greenhouse Gas emission estimate review and emissions reduction assessment for the Valhalla Gas Exploration and Appraisal Program. The study will address the following:

- Review of the GHG estimates already presented in the document “Valhalla Gas Exploration and Appraisal Program Section 38 Referral – Supporting Information Document” (BNR_ENV_RE_002), Section 6.3. Provide advice in regard to the adequacy of the estimates (including calculation methodology) and suggest any required updates to the estimates.
- Undertake a benchmarking exercise to compare GHG emission estimates against other HFS exploration projects.
- Conduct an Emissions Reduction Assessment with the intention of identifying options that the Company could implement to mitigate GHG Emissions to ALARP.

Further to the above the study will address EPA’s Environmental Scoping Document requirements,

Item No.	EPA ESD Requirement
74	Provide credible estimates of scope 1, scope 2 and scope 3 greenhouse gas emissions (annual and total) in tonnes of carbon dioxide equivalent (CO2-e) over the life of the proposal. Detail methods used to estimate emissions.
75	Provide a breakdown of estimated scope 1 and scope 2 greenhouse gas emissions in tonnes of CO2-e by all sources. Consider all proposed activities in determining the sources of emissions (e.g. clearing of land, site preparations, drilling operations,

	hydraulic fracture stimulation operations including flaring, potential leakage etc).
76	Provide calculations and calculation methodology for determining estimated emissions of CO2-e for all sources.
77	Benchmark the proposal's emissions against other hydraulic fracture stimulation exploration projects. Information which supports that the identified projects are comparable to the proposal should be included.
78	Provide a greenhouse gas management plan, in accordance with EPA guidance, which demonstrates the proposal's trajectory towards net zero emissions by 2050. The plan should include at a minimum: a) information required by 74 to 77 above. b) a graph and table showing regular targets reflecting an incremental reduction in emissions towards net zero emissions by 2050. Where the proposed emissions reduction targets do not demonstrate a trajectory towards net zero by 2050, articulate clearly a compelling reason why it is not possible to achieve this. c) mitigation (avoidance, reduction, offset) measures to be implemented with associated timeframes and evidence to demonstrate that the interim and long-term targets will be met. Where it is proposed that, following implementation of the avoidance and reduction measures, authorised offsets will be applied to meet the targets, evidence which supports that the mitigation measures are capable of achieving the stated targets is not required. d) Analysis of other potential abatement measures (e.g. renewables) relevant to the proposal that are not proposed to be implemented which provides the rationale to support that these measures are unable to be implemented. e) reporting requirements for publicly and periodically reporting against the stated targets.

1.2 Project Location

Access to the Proposal area is via the Great Northern Highway and Calwynyardah-Noonkanbah Road from the township of Fitzroy Crossing. A map of the Proposal area is provided in Figure 1-1.

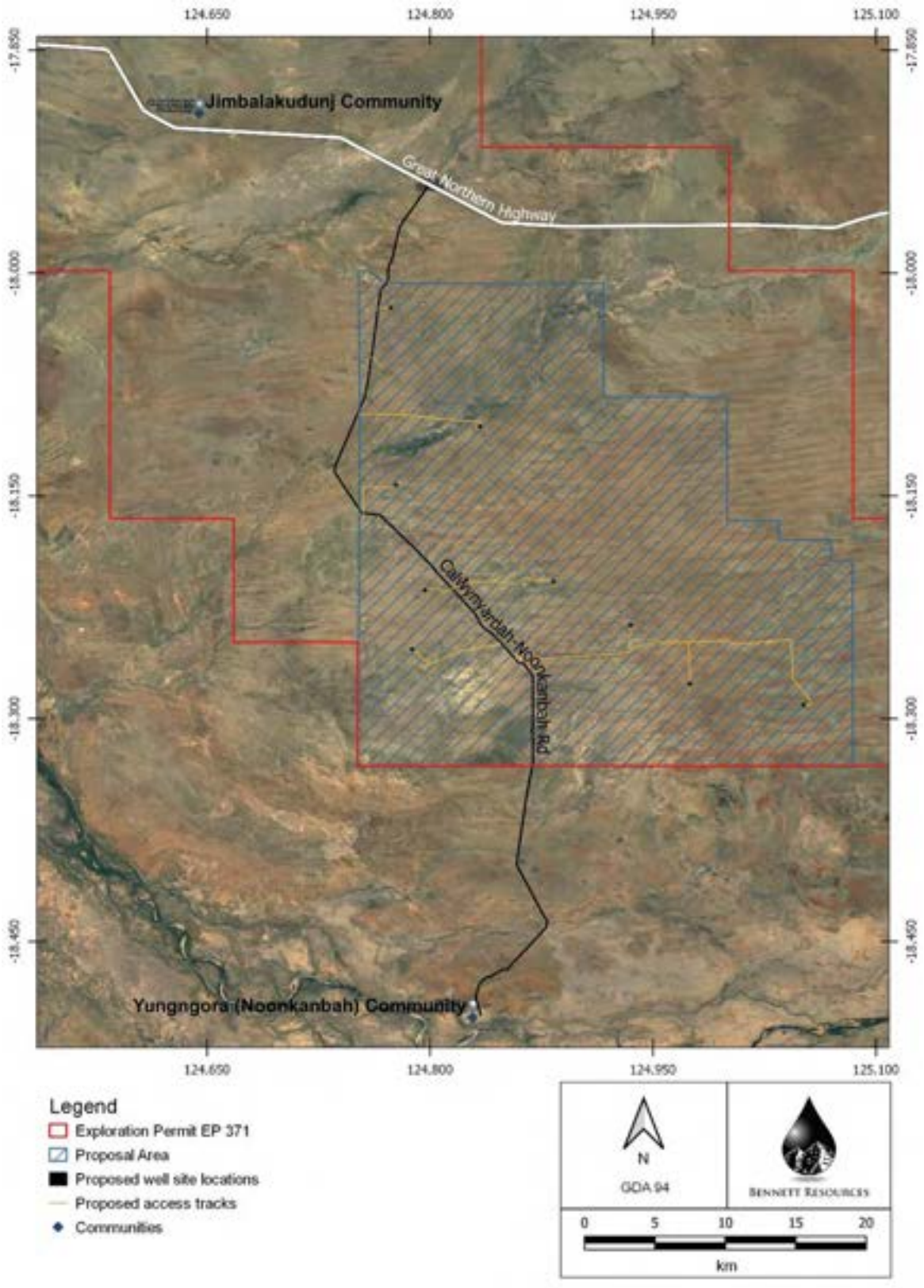


Figure 1-1: Valhalla Project Location

1.3 EPA Technical Guidance on GHG Mitigation

The WA EPA have provided a technical guidance for GHG emissions which is periodically updated from time to time for new or expanding operations with a GHG mitigation hierarchy of *avoid, reduce and offset*[2]. The Australian Government's principal mitigation initiative is currently the Emissions Reduction Fund (ERF) and the associated safeguard mechanism. The safeguard mechanism applies to facilities with direct emissions (scope 1) in excess of 100,000 tonnes CO2e per annum and requires liable entities to keep emissions at or below a predetermined (historical or calculated) emissions baseline. The EPA's objective is to ensure that the mitigation hierarchy is applied such that greenhouse gas emissions from proposals are avoided or reduced, and residual emissions offset, in the planning, design and operational stages. The Valhalla Gas Exploration and Appraisal Drilling Program will abide by the EPA guidelines to reduce GHG emissions according to the mitigation hierarchy during the project lifecycle.

1.4 Project Assumptions

The following GHG Emissions estimates in Table 1-1 was provided by BNR as part of the Valhalla E & A Program EPA referral submission. As noted in the table significant part of the emissions are associated with the flaring of the well test gas during the appraisal period.

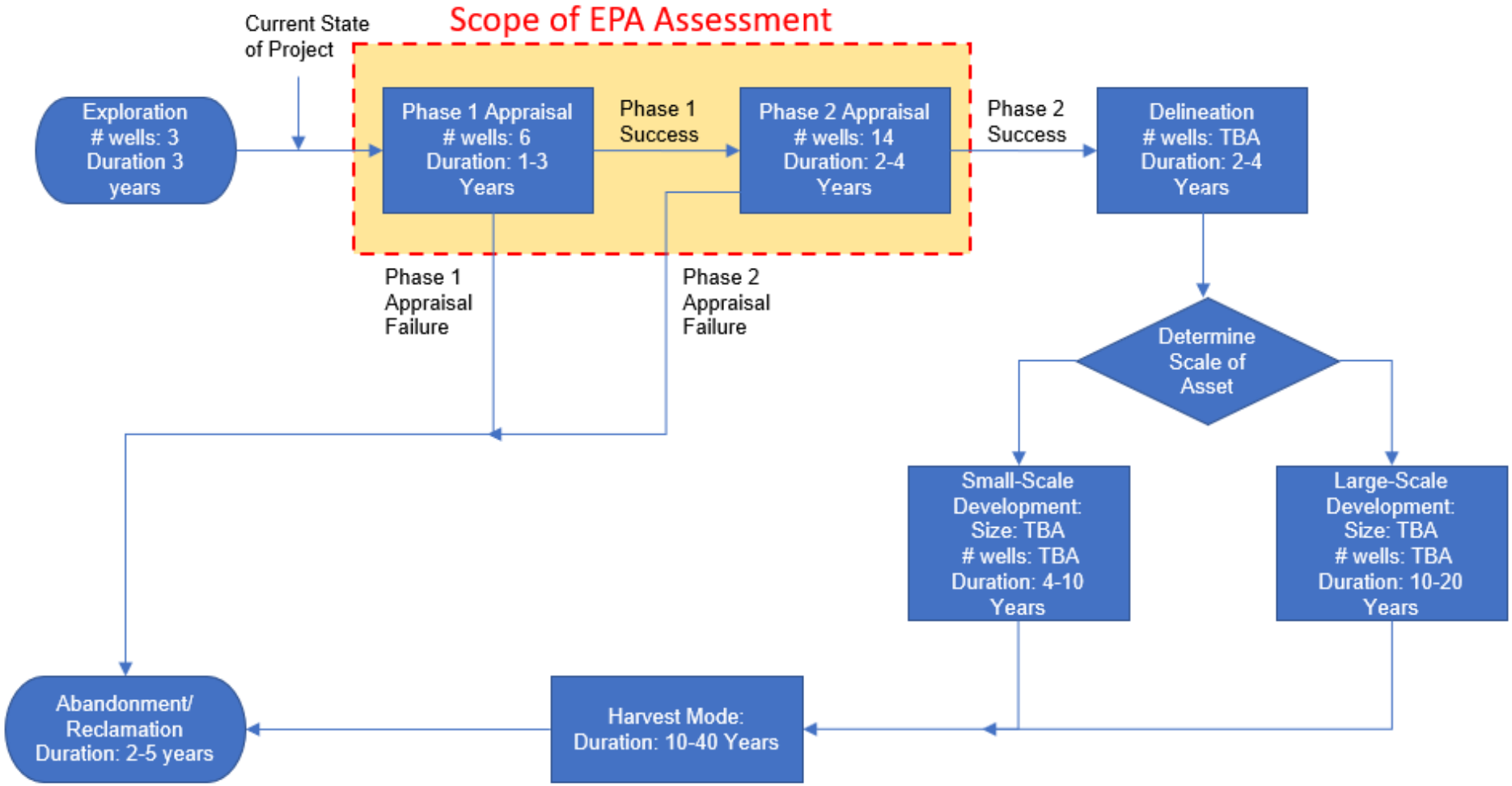
Table 6-9: Scope 1 GHG calculations per well

Activities	Emission source	Volume estimates (per well)		Total Scope 1 emissions per well (t CO_2-e)
Site preparation operations	Combustion emissions from diesel	20 m³		54
Drilling operations	Combustion emissions from diesel during mobilisation	10 m³		27
	Combustion emissions from diesel during Drilling operations	379 m³		1,023
HFS operations	Combustion emissions from diesel during mobilisation	20 m³		54
	Combustion emissions from diesel during HFS operations	300 m³		809
	CH_4 emissions during well testing	Gas Flow rate	Period of Flaring	<15,000
		~2.5 MMCFGPD	~90 days	
Site reinstatement	Combustion emissions from diesel	20 m³		54
			Total	17,021 t CO_2-e

Table 1-1: Current EPA Referral Submission for Valhalla E & A Program

During the period of GHG emissions evaluation, BNR advised the following key changes, which formed the basis of this study.

(1) A Well test gas flow Rate 5.9 mmscf/d will be required to evaluate the 6 Wells from Phase I.
(2) A Well test gas flow Rate 10.7 mmscf/d will be required to evaluate the 14 Wells from Phase II.
(3) A condensate to gas ratio (CGR) of 20 bbl/mmscf was assumed for the Valhalla reservoirs.
(4) A minimum test period of 60 days and maximum test period of 90 days is required per well.
(5) The following Road Map was provided for Valhalla Gas development:


Current State of Project
Scope of EPA Assessment
Exploration # wells: 3 Duration 3 years
Phase 1 Appraisal # wells: 6 Duration: 1-3 Years
Phase 1 Success
Phase 2 Appraisal # wells: 14 Duration: 2-4 Years
Phase 2 Success
Delineation # wells: TBA Duration: 2-4 Years
Phase 1 Appraisal Failure
Phase 2 Appraisal Failure
Determine Scale of Asset
Small-Scale Development: Size: TBA # wells: TBA Duration: 4-10 Years
Large-Scale Development: Size: TBA # wells: TBA Duration: 10-20 Years
Abandonment/ Reclamation Duration: 2-5 years
Harvest Mode: Duration: 10-40 Years

2 Review of GHG Emission Estimates

Based on the proposed activities associated with the Valhalla gas exploration and appraisal drilling program greenhouse gas emissions were estimated based on four activities as listed below,

(1) Land Clearing.
(2) Diesel Fuel Emissions.
(3) Fugitive Emissions.
(4) Well Testing Flaring.

These activities are directly associated with the operation of the proponent and are deemed as Scope 1 emissions. Indirect emissions associated with the Valhalla Exploration and Appraisal Drilling/HFS Operations Program is considered as Scope 2 emissions, such activities may include importation of power or other offsite energy supply activities related to the project. Scope 3 emissions are associated with all other indirect emission such as export of products from the project. The Valhalla Gas E & A program, at present, does not have the necessary infrastructure nor a market to export the gas or condensate from the project and intends to flare these hydrocarbons on site. Therefore, as a base case, no Scope 3 emissions are expected from the project. At present BNR is evaluating the possibility of selling the condensate after completing the initial appraisal wells and establishing a better understanding of the condensate volumes. Therefore, for completeness of this report Scope 3 emissions from condensate sale are also provided.

2.1 Land Clearing

The estimated land cleared for the 10 well sites (with 2 wells per site), access tracks and camp sites are tabulated below.

Land area	ha
Well Sites	40.1
Access Tracks	59.1
Camp Sites	2.8
Total	102

Table 2-1: Valhalla Exploration and Appraisal Drilling Program land clearing estimate

Forests, bushlands, grasslands and other vegetation, known as carbon sinks, remove carbon dioxide from the atmosphere. When such carbon sinks are cleared for industrial activity the associated loss of carbon sinks are counted as part of the greenhouse gas emissions estimate of the project. The Full Carbon Accounting Model (FullCAM) is a calculation tool for modelling Australia's GHG emissions from the land sector[3]. FullCAM is used in Australian National Greenhouse Gas Accounts for the land use change and forestry sectors. The FullCAM model estimates carbon stock change in ecosystems by considering above and below ground biomass, standing and decomposing debris and soil carbon resulting from land use activities. The latest version of the FullCAM model published in September 2020 was used for this estimate. Based on the spatial data input for the site location (Lat -18^{o} N, Long 124^{o} E), the following carbon mass estimate for calculated from the FullCAM model.

Component	(tC/ha)
Carbon mass of trees	16.4
Carbon mass of debris	13.9
Carbon mass of soil	25.9
Total Carbon mass on-site	56.3

Table 2-2: Site Carbon Mass Estimate

Based on the total land area cleared the total carbon emissions associated with land clearing is 5744 tCO2e and the average per well carbon emissions for the 20 well program is estimated as 287 tCO2e/well.

2.2 Diesel Fuel Emissions

The exploration and appraisal drilling program will involve several activities such as, site preparation, mobilisation of the drilling rig(s), drilling and completion of the exploration wells, mobilisation of the hydraulic fracturing rigs, hydraulic fracturing operations, testing of the wells, camp setup and operations of the camp during the drilling programs, transport of the workforce to and from site, and after the drilling activities are complete the reinstatement of the site. These activities are expected to be powered using diesel fuel for vehicle and in diesel engines. The following table provides an estimate of diesel fuel usage for these activities,

Per Well Data	Volume, KL
Site Preparation	20
Drilling Operations	316
HFS Operations	510
Site Reinstatement	20
Transport	344
Camp Site	8
Total	**1218**

Table 2-3: Diesel Fuel Usage per Well

The emissions from diesel fuel usage is estimated from National Greenhouse and Emissions Reporting (Measurement) Determination (2008) as updated in July 2020 and made under subsection 10(3) of the National Greenhouse and Energy Reporting Act 2007 [4]. Section 2.41 Method 1 of the NGER along with Fuel combustion emissions factors in Schedule 1 Part 3 for diesel fuel energy content factor and GHG emission factors as shown below,

Fuel	Energy Content	Emissions Factors (kgCO2e/GJ)		
	(GJ/ KLit)	CO2	CH4	N2O
Diesel	38.6	69.9	0.1	0.2

Table 2-4: NGER Emission Factors for Diesel Emissions

Based on the above emission factors average carbon emissions from diesel fuel usage per well was estimated as 3,300 tCO2e/Well.

2.3 Fugitive Emissions

Fugitive emissions include gas lost directly to atmosphere through uncontrolled sources during the drilling and HFS operations. The American Petroleum Institute produced a Compendium of greenhouse gas emission methodologies for the oil and natural gas industry[5]. Several methodologies used here are based on US EPA GHG estimation tables and has been also used by proponents who have filed their application for HFS projects in the Northern Territory under their new Code of Practice. The following sources were considered the main fugitive emissions sources as part of the greenhouse gas management program,

(i) Well completions: Completing new gas wells involves producing the fluids at a high rate to lift the excess sand to the surface and clear the well bore and formation to increase gas flow. Typically, the gas/liquid separator installed for normal well flow is not designed

for these high liquid flow rates and three-phase (gas, liquid, and sand) flow. Therefore, a common practice for this initial well completion step has been to produce the well to a pit or tanks where water, hydrocarbon liquids, and sand are captured, and slugs of gas vented to the atmosphere or flared. Completions can take anywhere from several hours to several weeks, during which time a substantial amount of gas may be released to the atmosphere or flared. Based on the following table from API compendium 25.9 tonnes/completion day of fugitive emissions was assumed.

Table 5-23. Production Segment CH_4 Emission Factors for Maintenance and Turnaround Activities

Source	CH_4 Emission Factor [a], Original Units	CH_4 Emission Factor [b], Converted to Tonnes Basis	CH_4 Content Basis of Factor [c]	Uncertainty [d] (±%)
Vessel blowdowns	78 scfy/vessel	0.0015 tonnes/vessel-yr	78.8 mole %	326
Compressor starts [e]	8,443 scfy/compressor	0.1620 tonnes/ compressor-yr	78.8 mole %	190
Compressor blowdowns	3,774 scfy/compressor	0.07239 tonnes/ compressor-yr	78.8 mole %	179
Gas well workovers [f] (tubing maintenance)	2,454 scf/workover	0.04707 tonnes/workover	Not given	924
Oil well workovers [f] (tubing maintenance)	96 scf/workover	0.0018 tonnes/workover	Not given	Not available
Gathering gas pipeline blowdowns	309 scfy/mile	0.00593 tonnes/mile-yr 0.00368 tonne/km-yr	78.8 mole %	39.5
Onshore gas well completion [g]	$1,712\times10^3$ scf/ completion-day	25.9 tonne/completion-day	78.8 mole %	Not available
Offshore gas well completion [g]	$\sim8,700\times10^3$ scf/ completion-day	131.5 tonne/completion-day	78.8 mole %	Not available
Oil pump stations (maintenance) [h]	1.56 lb/yr-station	7.076E-04 tonnes/station-yr	Not given	Not available

Footnotes and Sources:

[a] Shires, T.M. *Methane Emissions from the Natural Gas Industry, Volume 7: Blow and Purge Activities, Final Report*, GRI-94/0257.24 and EPA-600/R-96-080g, Gas Research Institute and U.S. Environmental Protection Agency, June 1996.

[b] CH_4 emission factors converted from scf or m^3 are based on 60°F and 14.7 psia. The CH_4 emission factors can be adjusted based on the relative concentrations of CH_4 and CO_2 to estimate CO_2 emissions.

[c] Shires, T.M., and M.R. Harrison. *Methane Emissions from the Natural Gas Industry, Volume 6: Vented and Combustion Source Summary, Final Report*, GRI-94/0257.23 and EPA-600/R-96-080f, Gas Research Institute and U.S. Environmental Protection Agency, June 1996.

[d] Uncertainty based on a 95% confidence interval.

[e] An EPA Gas STAR paper on engine starts reports that typical production compressor engine start-ups vent 1,000 to 5,000 scf of gas with each start-up attempt (EPA Gas STAR, PRO Fact Sheet No. 101, September 2004). This equates to 0.015 to 0.076 tonnes CH_4/start-up attempt assuming 78.8 mole % CH_4 in the gas.

[f] Factor taken from: Tilkicioglu, B.H. *Annual Methane Emission Estimate of the Natural Gas Systems in the United States*, Phase II, Pipeline Systems Incorporated (PSI), September 1990. An EPA Gas STAR paper on installing plunger lift systems in gas wells presents a gas well workover emission factor of 2000 scf CH_4/workover, which equates to 0.0384 tonnes CH_4/workover (EPA Gas STAR, Lessons Learned - Installing Plunger Lift Systems in Gas Wells, October 2003). Gas STAR also reports that the number of gas well workovers conducted in a year typically ranges from 1 to 15.

[g] EIA, U.S. Natural Gas Markets: Mid-Term Prospects for Natural Gas Supply, December 2001. Cites data for initial rates of production for completions in 2000. Offshore factor interpolated from chart "Initial Flow Rates of New Natural Gas Well Completions, 1985-2000." The total gas basis was converted to a CH_4 basis assuming 78.8 mole % CH_4 in production using the GRI/EPA average CH_4 composition for production operations.

[h] Tilkicioglu, B.H. and D.R. Winters. *Annual Methane Emission Estimate of the Natural Gas and Petroleum Systems in the United States*. Pipeline Systems Incorporated (PSI), December 1989.

Table 2-4: Fugitive Emissions from Onshore Wells (API –Compendium of greenhouse gas emission methodologies for the oil and natural gas industry Table 5-23)

Based on discussions with BNR, it was confirmed that RECs (Reduced Emissions Completions) will be used and no cold venting will occur during well completions and negligible amount of fugitive emissions are expected from well completions activities.

(ii) Drill cuttings: Drill cutting generated during the drilling into hydrocarbon formation contain methane and other hydrocarbons. These cutting produce gaseous emissions from thermal desorption. The quantity of gas absorbed in the drill cuttings are estimated based on cutting volume, porosity and gas saturation.
In order to estimate the fugitive gas emission from drill cutting BNR indicated a total volume of 156m3 was used with a porosity of 8% and a gas saturation of 46.5%. The methane quantity associated with the drill cuttings was estimated as 1.18 tonnes per well and the associated GHG emission was estimated as 29.6 tCO2e, assuming a 25tCO2e/tCH4 as per NGERs.

(iii) Wastewater Storage: Emissions from wastewater recovered from flowback and held in storage tanks can be estimated using Compendium of greenhouse gas emission methodologies for the oil and natural gas industry Table 5-10. An emissions factor of 0.39896 tonnes of methane/ML of produced water was used.
In order to estimate the fugitive emissions from wastewater, BNR indicated a 2 ML per well would be recovered. Therefore, methane emissions were estimated at 0.78 tonnes per well and the associated GHG emissions was estimated as 19.5 tonnes CO2e, assuming 25 tCO2/tCH4 as per NGERs.

Table 5-10. Produced Salt Water Tank Methane Flashing Emission Factors

Separator Pressure (psi)	Produced Water Salt Content	GRI/EPA Emission Rate [a], Original Units (10^6 lb CH_4/yr)	Water Tank Emission Factor	
			tonnes CH_4 /1000 bbl produced water [b]	tonnes CH_4 /1000 m^3 produced water
50	**20%**	**1.6**	**0.0015**	**0.009185**
250	20%	10.8	0.00986	0.06200
250	10%	16.4	0.0150	0.09414
250	2%	19.4	0.0177	0.11137
250	**Average of 10.7% [c]**	--	**0.0142**	**0.08917**
1000	20%	38.8	0.0354	0.22273
1000	10%	58.7	0.0536	0.33697
1000	2%	69.5	0.0634	0.39896
1000	**Average of 10.7% [c]**	--	**0.0508**	**0.31955**

Footnotes and Sources:
[a] Emission factors developed from Table 5-5 of Shires, T.M., and M.R. Harrison. *Methane Emissions from the Natural Gas Industry, Volume 6: Vented and Combustion Source Summary, Final Report*, GRI-94/0257.23 and EPA-600/R-96-080f, Gas Research Institute and U.S. Environmental Protection Agency, June 1996.
[b] Process simulation modeling based on 1990 annual salt water production of 497 million barrels from Energy Environmental Research Center, 1995.
[c] Average of emission factors at 20, 10, and 2% salt.

Table 2-5: Fugitive Emissions from Produced Water Storage (API –Compendium of greenhouse gas emission methodologies for the oil and natural gas industry Table 5-23)

2.4 Well Testing Flare

As part of the drilling program the exploration and appraisals wells are flow tested over a minimum of 60 days and a maximum period of 90 days and at an average flow rate of 5.9 mmsc/d for the 6 wells in Phase 1 and 10.7 mmscf/d for the 14 wells in Phase 2 to evaluate the commercial viability of the Valhalla

shale gas formation. The produced hydrocarbons from the well tests are directed towards a flare with a minimum destruction efficiency of 98% to ensure maximum practical combustion of the hydrocarbons. Methane has a hydrocarbon potential 25-times more than CO2 and hence gas is flared during all well tests to reduce greenhouse gas emissions. The expected condensate to gas ratio (CGR) in the Valhalla formation is around 20 bbl/mmscf, hence a condensate flow rate of 118 bbl/day is expected during Phase I of the well testing program and 214 bbl/d during Phase II of the well testing program. The condensate is assumed to be flared at site as a base case, while BNR is investigating the possibility of trucking the condensate out of site for sale.

The greenhouse gas associated with the flaring of the gas and condensate is estimated based on National Greenhouse and Emissions Reporting (Measurement) Determination (2008) as updated in July 2020 and made under subsection 10(3) of the National Greenhouse and Energy Reporting Act 2007 [4]. Section 3.44 Method 1 of the NGER along with Fuel combustion emissions factors as shown below,

Fuel	**Emissions Factors (tCO2/t Gas flared)**		
	CO2	**CH4**	**N2O**
Gas Flared	2.8	0.933	0.026
Condensate Flared	3.2	0.009	0.060

Table 2-6: NGER Emission Factors for Gas and Condensate Flared

The amount of gas flared was estimated based on an expected gas composition of CH4 87 mol%, C2 5.5 mol%, C3 2.7 mol% and inerts 4.8 mol% and the average density of gas of 0.79 kg/m3 at standard conditions. The average density of the condensate was assumed to be 750 kg/m3.

Based on the above emission factors and the estimated weight of gas and condensate flared per day of well testing along with GHG emissions associated with the gas and condensate flaring per day per well is shown in Table 2-7 below.

Emissions per Well per day	**Phase I**	**Phase II**
Gas Flared (tonnes/d)	131.9	239.2
Condensate Flared (tonnes/d)	14.1	25.5
GHG Emissions from Gas flared (tCO2e/d)	496	899
GHG Emissions from Condensate flared (tCO2e/d)	46	83

Table 2-7: Quantity of Gas and Condensate Flared and associated GHG Emissions.

A minimum and maximum emissions per well is based on the minimum well test period of 60 days and a maximum well test period of 90 days.

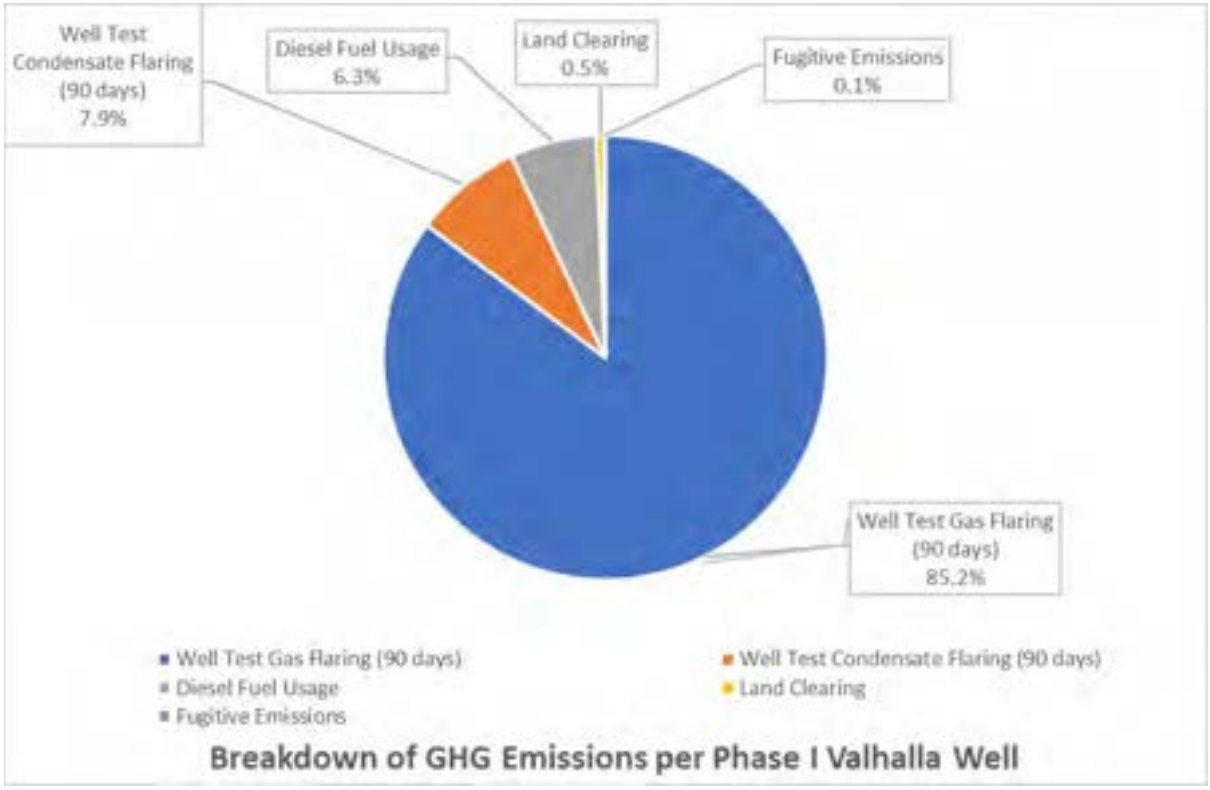
2.5 Summary of Scope 1 GHG Emissions

Based on the above GHG emissions calculations, results are presented for a single well and for the total number of wells over the minimum 60 day and maximum 90-day test period for Phase I and Phase II of the Valhalla Exploration and Appraisal program in Table 2-7 below,

CO2 Emissions per E&A Well	Input Parameter	Phase I - 6 Wells (t CO2e)		Phase II - 14 Wells (t CO2e)		Calculation Reference
		60 days Well Test	90 days Well Test	60 days Well Test	90 days Well Test	
Land Clearing (per well)						
Land Clearing Emissions	5.1 ha per Well, 56.3 tCO2e/ha	287	287	287	287	FullCAM Model (2020) https://www.industry.gov.au/data-and-publications/full-carbon-accounting-model-fullcam
Diesel Emissions (per well)						
Site Preparation	20	54	54	54	54	National Greenhouse and Energy Reporting Guidelines (https://www.legislation.gov.au/Details/F2017C00508) Section 2.41 with Table in Schedule 1 Part 3.
Drilling Operations	316	857	857	857	857	
HFS Operations	510	1,382	1,382	1,382	1,382	
Site Reinstatement	20	54	54	54	54	
Transport (Vehicles/Rigs)	344	931	931	931	931	
Site Power	8	15	22	15	22	
Well Test Flare (per well)						
Gas	Ph I: 5.9 mmcsf/d Ph II: 10.7 mmscf/d	29,747	44,620	53,948	80,921	National Greenhouse and Energy Reporting Guidelines (https://www.legislation.gov.au/Details/F2017C00508) Section 3.44.
Condensate	Ph I : 118 bbl/d Ph II : 214 bbl/d	2,760	4,140	5,005	7,507	National Greenhouse and Energy Reporting Guidelines (https://www.legislation.gov.au/Details/F2017C00508) Section 3.52.
Fugitive Emissions (per well)						
Drill cuttings	Gas 0.12 tonnes	30	30	30	30	Based on volume of drill cuttings and Vallhalla gas saturation.
Waste Water Tank	2 ML flowback	20	20	20	20	API GHG Emissions Methodologies for Oil and Gas, Table 5-10
Total GHG Emissions per Well (tCO2e)		**36,136**	**52,396**	**62,582**	**92,065**	Scope 1 (direct emissions)
Total Emissions E&A Program (tCO2e)	**Ph I 6 Wells Ph II 14 Wells**	**216,814**	**314,378**	**876,144**	**1,288,915**	Scope 1 (direct emissions)

Table 2-7: Valhalla E & A Program GHG Emissions Summary

The results can be represented in a pie-chart for comparison of various sources of GHG emissions per well as shown in Figure 2-1 below.



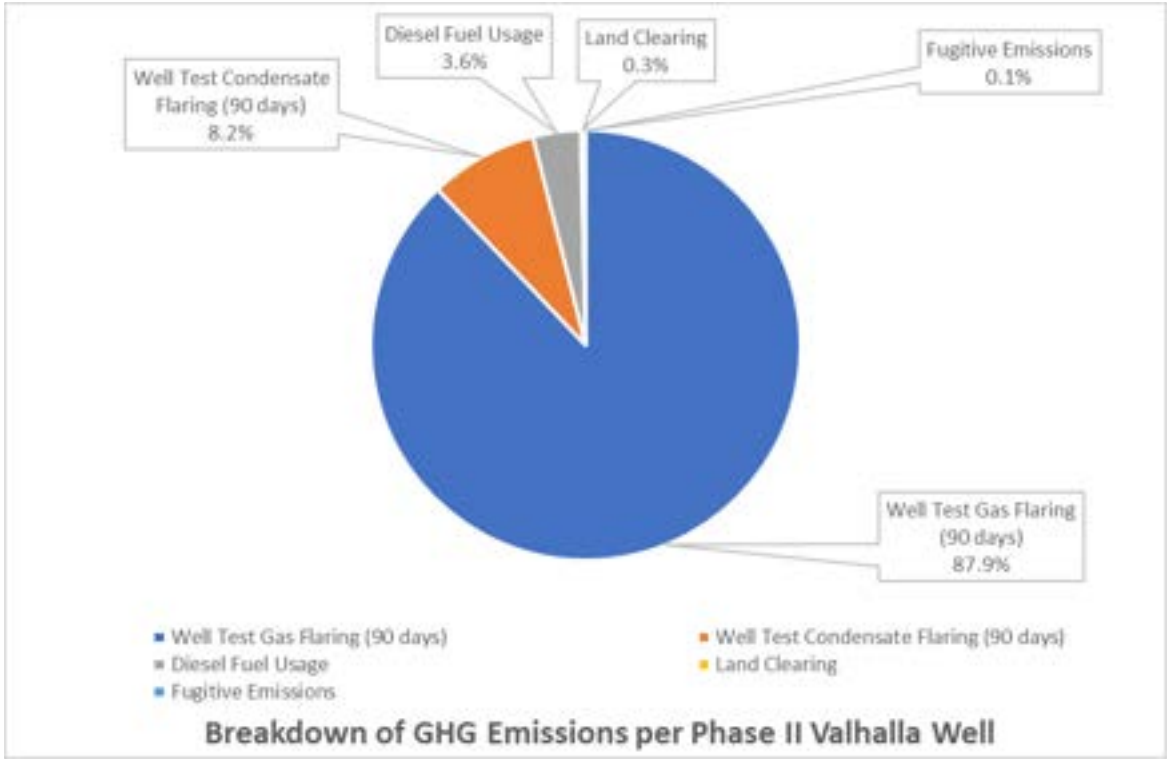


Figure 2-1: Breakdown of GHG Emissions per for 90-day Well Test for Phase I and Phase II of the Project

2.6 Project Overall Direct GHG Emissions (Scope 1)

The overall timeline of the Valhalla E & A Program could be between 3-7 years, where Phase I could take from 1-3 years and Phase II could take from 2-4 years depending on several technical and commercial factors. Therefore, two timelines and the associated GHG emissions for each of these timelines are provided below. Timeline #1 is an optimistic scenario where Phase I will be competed in Year 1 and Phase II will be completed in Year 2 and Year 3 of the Program. Timeline #2 is a resource constraint scenario where Phase I will take 3 years and Phase 4 will take another 4 years of the Program. Figure 2-2 provides annual GHG emissions for Timeline #1 and Figure 2-3 provides annual GHG emission for Timeline #2 for the Valhalla E & A Program.

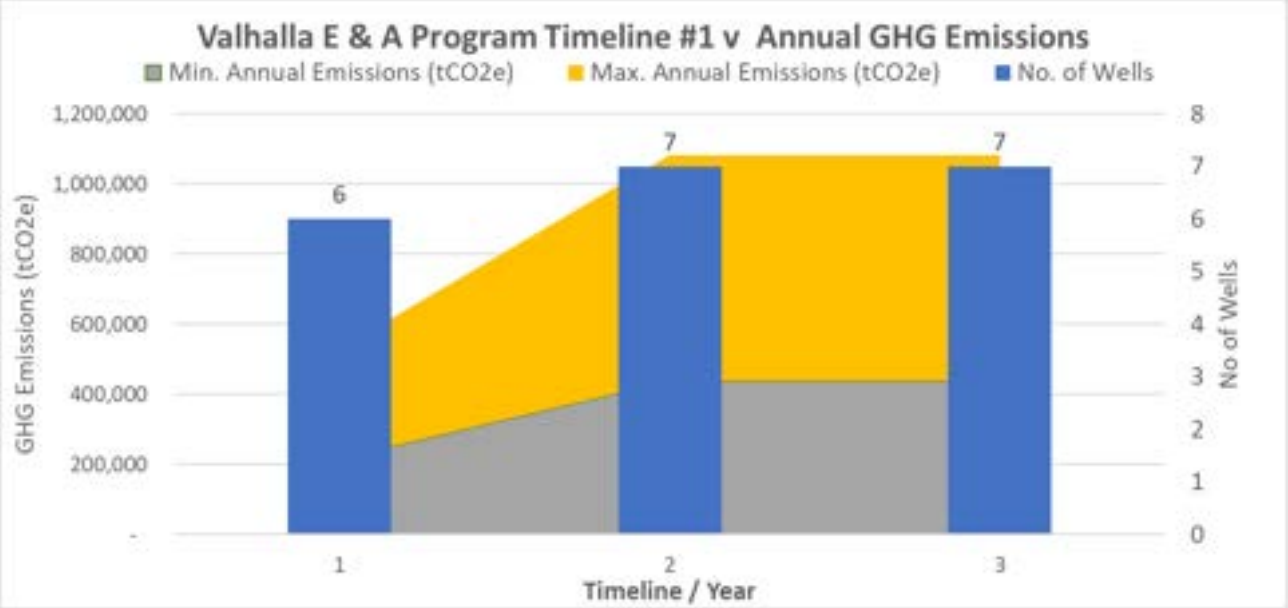


Figure 2-2: Timeline #1 for Overall Scope 1 GHG Emissions of the Valhalla E&P Program

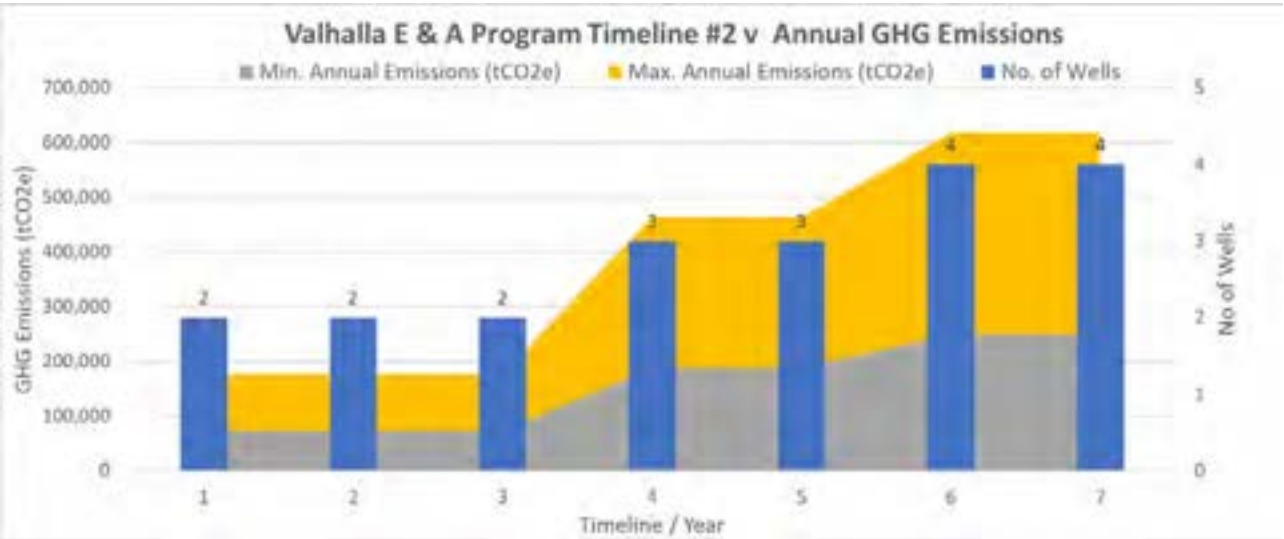


Figure 2-3: Timeline #2 for Overall Scope 1 GHG Emissions of the Valhalla E&P Program

2.7 Project Scope 2 Emissions

Indirect emissions from the generation of purchased energy consumed by a company is classified as Scope 2 emissions. The Valhalla Gas Exploration and Appraisal Program is intended to evaluate the quality of the gas field with drilling of exploration and appraisal wells, hydraulic fracture stimulation and flow tests. The E & P program does not intend to import power from third parties hence no Scope 2 emissions are envisaged as part of the project.

2.8 Project Scope 3 Emissions

All other indirect emissions not included in Scope 2 emissions that occur during the 7-years of the project is classified as Scope 3 emissions. The possibility of selling the condensate collected during the well test program to third parties rather than being flared at site is currently being evaluated as a recommended greenhouse gas mitigation measure. The emissions associated with the transportation and utlisation of condensate as a fuel is considered Scope 3 emissions for the project. For the purpose of this estimate the condensate produced from the well tests (minimum 60 day test period, maximum 90 day test period) was assumed to be collected and shipped from site. The condensate collected over the 7-years of the E & A program was assumed to be shipped from Wyndham to Singapore where it was assumed to be processed and consumed. A transportation emission factor of 130gCO2e/tonne/km of condensate[6]. Fuel combustion emissions from the condensate was estimated based on NGERs Method 2.41 – Schedule 1 Table Part 3 assuming the properties of Kerosene [4] along with a 10% factor for emission associated with the refining and selling of the condensate.

Scope 3 Emissions	**Min**	**Max**
Condensate Volume (bbls)	222,240	333,360
Condensate Transport Emissions (tCO2e)	13,952	20,928
Condensate Consumption Emissions (tCO2e)	91,571	137,356
Total Scope 3 Emissions (tCO2e)	105,523	158,284

Table 2-8: Scope 3 Emissions from Valhalla E & A Program

There are also other Scope 3 indirect emissions associated with the project including employee commuting, business travel and purchase of goods and services, which are considered minimal for the purpose of this estimation.

2.9 Breakdown of GHG Emissions

The results for the GHG emissions for the Valhalla E & A Program can be summarized as below considering both the condensate flaring and condensate sale option.

GHG Emissions (tCO2e)	**Condensate Flared**		**Condensate Sold**	
	Min	**Max**	**Min**	**Max**
Scope 1	1,082,222	1,592,556	995,593	1,462,614
Scope 2	-	-	-	-
Scope 3	-	-	105,523	158,284
Total Emissions(tCO2e)	**1,082,222**	**1,592,556**	**1,101,116**	**1,620,898**

Table 2-9: Overall Project Emissions from Valhalla E & A Program

It should be noted that the overall emissions with the condensate sale options is higher due to transportation and processing emission of the condensate. But the condensate would be utilized for an energy application rather than flared at site as a waste product displacing emissions from another source.

3 GHG Emissions Benchmarking

As part of the GHG emissions benchmarking exercise, carbon emissions from the Valhalla Exploration and Appraisal Program activities were compared with previous Buru Energy HFS exploration and appraisal drilling activity in the Canning Basin along with the recently approved drilling and HFS projects in the McArthur and Beetaloo sub-basins in the Northern Territory. A brief description of the other projects used for the benchmarking exercise is provided below with focus on critical emission sources such as the gas and condensate flare rates.

3.1 Buru – Canning Basin - TGS14 Project

Buru Energy carried out a HFS program in four wells Yullaroo-3, Yullaroo-4, Valhalla North-1 and Asgard-1 Wells in 2014, these wells were constructed in 2012/13 and the integrity of the wells were assessed prior to the HFS program in 2014 [7]. The activities for Tight Gas Pilot Exploration Program (TGS14) consist of hydraulic fracturing to stimulate the vertical component of the tight gas reservoir, the well flowed back and the resultant flow of gas and liquid hydrocarbons from the well was then measured and analysed over a period of time. The maximum well test flow rate of 2 mmscf/d was used during the tests where gas was flared over the 3-month testing period. Condensate removed from the well test separator was stored on site and trucked out for sales.

3.2 Origin - Betaloo Basin – Valkerri Project

Origin filed an Environmental Management Plan (EMP) for drilling, HFS and well testing of Velkerri 76 S2 exploration well on EP 76 in the Betaloo Basin in the Northern Territory in accordance the NT Petroleum (Environment) Regulations 2016, Code of Practice: Onshore Petroleum Activities in the Northern Territory [8]. The exploration well will consist of 2000-3000 m vertical component and horizontal section of 3000 m. The well testing program is planned for 3-12 months. A well testing rate of 2.5 TJ/d is envisaged with 37.5 bbl/d of condensate produced. The condensate will be flared along with the well test gas in a vertical flare.

3.3 Origin - Betaloo Basin – Kyalla Project

Origin has also filed EMP for a multi-well drilling, stimulation and well testing program in Kyalla 117 N2 [9]. Origin obtained approval for the Kyalla 117 N2-1H well in 2019 and have applied for Kyalla 117 N2-2H and Kyalla N2-3H drilling, HFS and well testing to utilise multi-well pads to improve efficiency and reduce environmental footprint in 2021. The program is intended to optimise multi-well pad layout of surface operations for potential future development scenario with the core objective of minimising the environmental footprint, including minimising land clearance, maximising water reuse and reducing greenhouse gas emissions. The exploration well will consist of 1500 m lateral length for 1H well and 2800 m lateral length for 2H and 3H wells. The well testing program is planned for 3-6 months. A well testing rate of 1.5 TJ/d is envisaged with 15 bbl/d of condensate produced. The condensate will be flared along with the well test gas in a vertical flare.

3.4 Santos – McArthur Basin EP161 Project

Santo has filed an EMP for a multi-well drilling, stimulation and well testing program with Tanumbirini 1, Tanumbirini 2H and Inacumba 1/1H wells in 2019[10]. The exploration well will consist of 2000 m lateral length for both wells. The well testing program is planned for 3-12 months. A well testing rate of 1.55 mmscf/d is planned with condensate produced will be trucked out of site and not flared.

3.5 Imperial – McArthur Basin – Carpinteria 1

Imperial filed an EMP with NT EPA for the drilling of the Carpentaria 1 well in EP 187 in the McArthur Basin for the vertical pilot well and with no HFS activities [11]. The drilling program will include inflow and production testing of the vertical zone where gas would be flared at 1.2 mmscf/d over a 90 day period.

3.6 Comparison of HFS Exploration and Appraisal Projects

A comparison table is provided summarizing project datal along with the Valhalla E & A Project.

Project	List of Wells	No of Wells	Lateral Drilling, m	HFS	Gas Flare Rate	Condensate Flare Rate	Test Period
Origin -Kyalla	Kyalla 117 N-1H Kyalla 117 N-2H Kyalla 117 N-3H	3	1500-1800	Y	1.5 TJ/d	15 bbl/d	3-12 months
Origin - Valkerri	Velkerri 76 S2	1	3000	Y	2.5 TJ/d	37.5 bbl/d	3-6 months
Santos - McArthur	Tanumbirini x 2 Inacumba x 1	3	2000	Y	1.55 mmscf/d	NA	3-12 months
Imperial - Carpenteria 1	Carpenteria 1	1	NA	N	1.2 mmscf/d	NA	3 months
Buru-TGS14	Yulleroo 5 Yulleroo 6 Valhalla North 1 Asgard 1	4	NA	Y	2 mmscf/d	NA	3 months
BNR -Valhalla	Phase I - Refer ERD	6	1500	Y	5.9 mmscf/d	118 bbl/d	2-3 months
	Phase II- Refer ERD	14	3000	Y	10.7 mmscf/d	214 bbl/d	2-3 months

Table 3-1: Exploration & Appraisal Project Comparison Summary

3.7 Benchmarking Exercise

All Exploration and Appraisal projects are different and have unique components, for the purpose of this benchmarking comparison, the exploration wells with horizontal drilling and HFS was compared with the Valhalla E & A Program, hence the BuruTGS14 and Imperial Carpinteria 1 programs were not used for the benchmarking exercise.

In order to benchmark projects for their GHG emissions, typically, GHG emissions intensity values are calculated on a 'tCO2e per tonne of product' basis for manufacturing projects or 'tCO2e per kWh' basis for power generation projects such that project emissions can be compared. GHG emission intensities from gas exploration projects cannot be compared on such a basis. Therefore, couple of methods were used to benchmark the Valhalla E & A program gas exploration project emissions along with the Origin and Santos exploration programs. GHG emissions intensities on a per Well per Test Day for the Valhalla wells along with other projects is shown in Figure 3-1. The results clearly indicate significantly more emission from the Valhalla well tests per day due to its higher well test flow rates per day. It should be noted that the Origin and Santos test programs are planned for a significantly longer period from up to 3-12 months compared to 2-3 months for Valhalla. Therefore, another comparison could be made based on the planned minimum and maximum total emission per well from these exploration and appraisal programs. Figure 3-2 provides planned total emission per well from these projects.

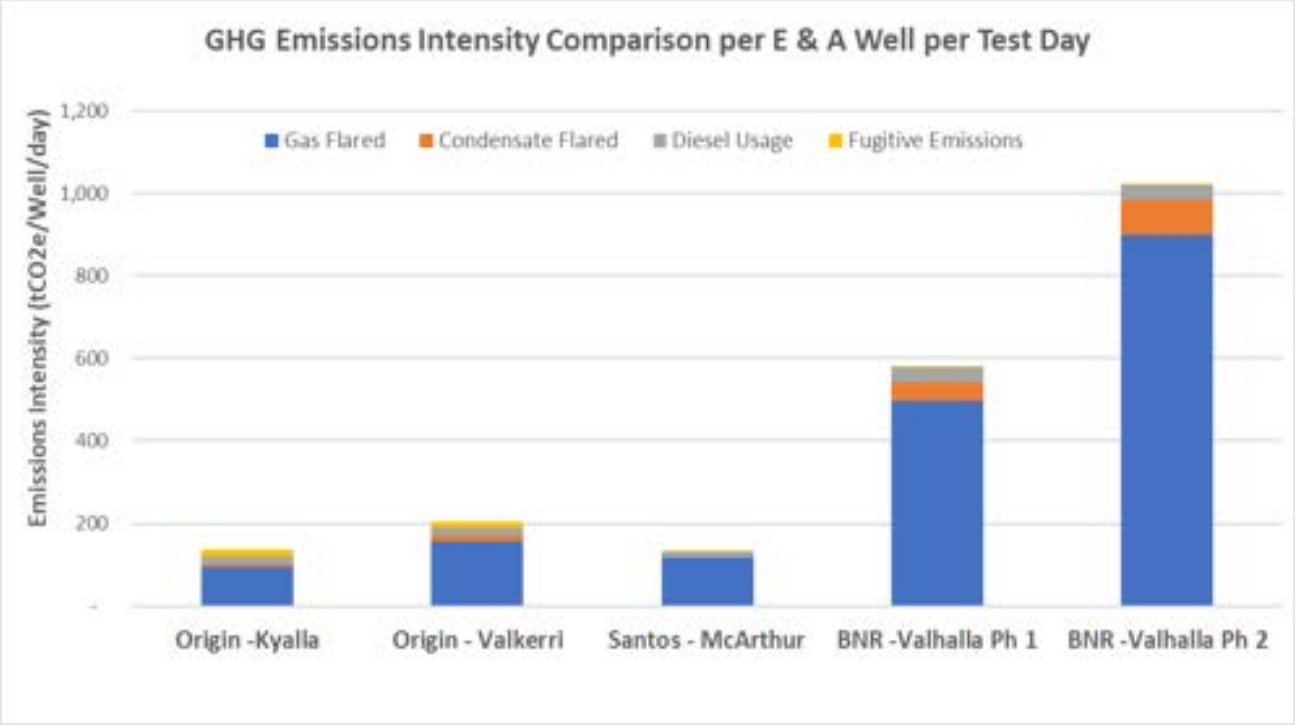


Figure 3-1: Benchmarking GHG Emission of the Valhalla E&P Program per Well per Test Day

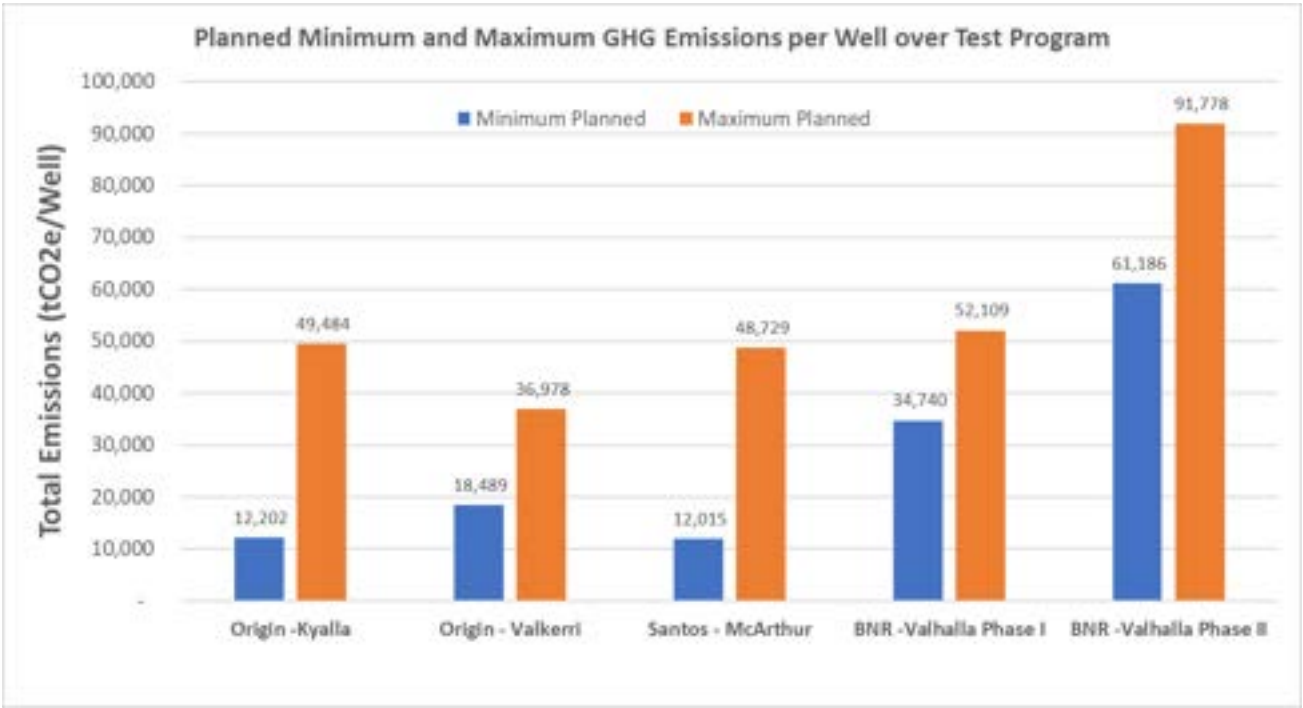


Figure 3-2: Benchmarking GHG Emission of the Valhalla E&P Program for planned toral emissions per Well

The results indicate the Valhalla Phase I emissions are compatible with the permitted/planned total emissions of other projects in the Beetaloo Basin in the NT. The Valhalla Phase II emissions are higher

than the other projects due to its higher flow test rates which is at the later part of the project. It should be also noted that Origin-Kyalla prgram is based on 3 wells, Origin-Valkerri program is based on 1 well and Santos-McArthur program is based on 2 wells while Valhalla Phase I is based on 6 wells and Valhalla Phase II is based on 14 wells. The Valhalla E & A program provides a complete scale of the development program for the Valhalla field while the other project proponents have only provided the very early part of their E & A program.

3.8 GHG Emissions comparison with State and National Emissions

The following table provides a comparison of the total Valhalla E & A program GHG emissions from the 20-well program over the proposed two timelines as a percentage of the state and national GHG emissions.

	mtCO2e	**% of State Emissions**	**% of National Emissions**
Annual WA State Emissions[1] (2019)	91.85		
Annual Australian National Emissions[2] (2019)	529.30		
Valhalla - Timeline #1 (3 Years)	1.59	0.58%	0.10%
Valhalla - Timeline #2 (7 Years)	1.59	0.25%	0.04%

[1] Based on 2019 WA GHG emissions. [2] Based on 2019 National GHG Emissions.

Table 3-2: GHG Emissions compared to State and National Emissions

The GHG emissions from the Valhalla E & A program contributes to a small fractional increase in the state GHG emissions and a much smaller fractional increase in the national GHG emissions.

4 GHG Emissions Reduction Assessment

This section outlines the measures incorporated into the Valhalla Exploration and Appraisal Program to reduce GHG emissions and reduce overall carbon footprint of the project. The following measures have been evaluated for the drilling and HFS operations as Reduced Emissions Completions (RECs), as recommended in the WA Scientific Inquiry into Hydraulic Fracking for the mitigation of greenhouse gas emissions.

4.1 Use of single pad for multiple horizontal drills.

Single well-pad vertical designs result in significantly less land clearing. The use of efficient multi-well pad horizontal shale development results 50%-60% reduction in land use as shown in Figure 4-1.

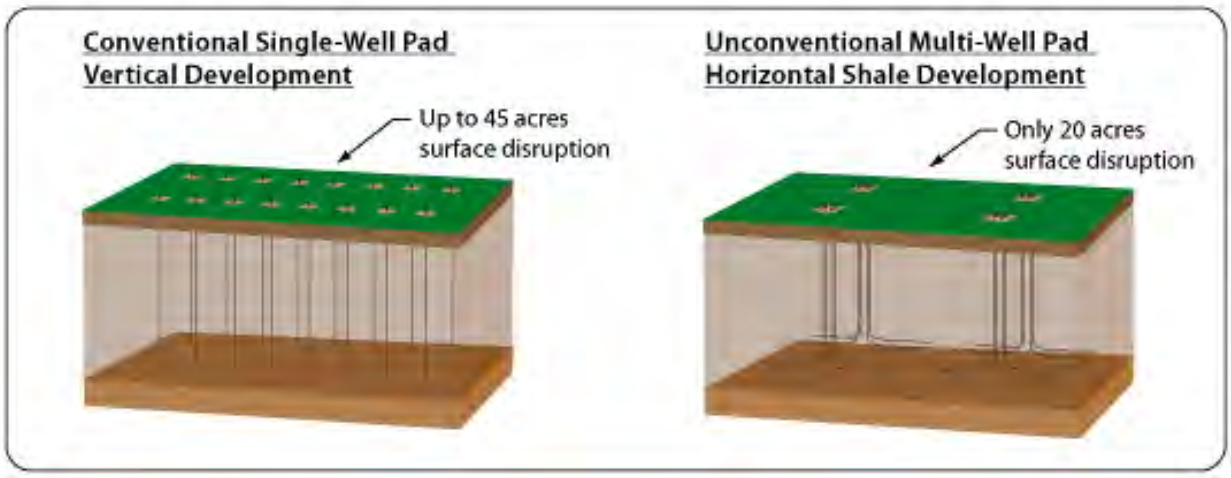


Figure 4-1: Single v Multi Well Pad designs

The Valhalla Exploration and Appraisal program utilizes 10 well pads for drilling 20 wells, implementing an efficient multi-well drilling technique to minimize land clearing. The minimization of land clearing reduces the impact associated with GHG emissions associated with the removal of vegetation. A total land cleared for the 20 well program is 102 ha of which 40 ha is associated with the well sites, therefore reducing overall land cleared by around 40%.

4.2 Use of latest (Tier 4 – US or Stage V -EU) diesel engines.

The diesel engines used for the drilling and HFS operations will employ the latest efficient units with highest emission standards. The Tier 4 diesel engines have 90% lower NOx and PM emission compared to Tier 3 engines and are fuel efficient resulting 15% GHG emissions reduction. In Europe, Stage V is the latest and the strictest tier of these regulations for emissions with regards to upstream oil and gas applications.

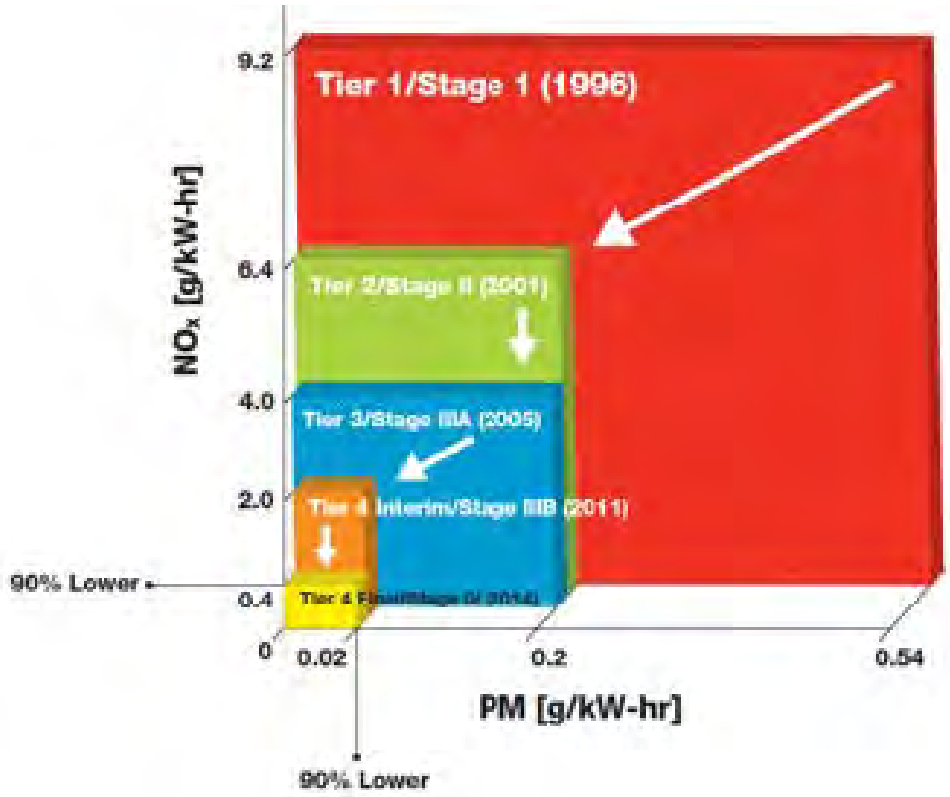


Figure 4-2: Tier 4 Diesel Engine Performance

4.3 Collection and sale of condensate.

As recommended by the WA Hydraulic Fracking Inquiry Report the well construction activities Reduced Emissions Completions (REC) should be employed where feasible so that gas and condensate is captured for sale or other use. The well test fluids during the exploration and appraisal program could be passed via a sand trap and 3-phase separator to remove water and condensate from the gas where the condensate could be stored and trucked out of site for sales to a refinery. BNR is currently evaluating options for the sale of condensate produced from the well tests via Wyndham Port to Singapore, where Buru Energy already exports its oil.

4.4 Flare Design

Gas venting is avoided during the well completions and well tests and only permitted for operational or safety reasons. Gas flaring is carried out in accordance with Code of Practice requirements and as per US EPA 40 CFR 63.11, with a flare tip combustion efficiency of 98%. Two separate vertical stacks, one for flowback high pressure gas and a second low pressure flare to manage tank vapors (off storage tanks) would be used to ensure all methane at site is flared. Both flare systems would utilize an auto-ignite system, gas assist, and a single pilot.

Figure 4-3: Multi-Stack Vertical Flare for low-pressure and high-pressure gas

4.5 Gas Capture

The Canning Basin does not have any gas infrastructure such that the flow test gas can be treated and sent to a gas pipeline for sale. Therefore, the only possibility would be to capture the gas as Compressed Natural Gas (CNG) or utilising Mini-LNG facilities as described below and supply it to energy users in the Kimberley.

4.5.1 Compressed Natural Gas

The well test gas would be required to be dehydrated and compressed to around 250 bar to be stored in high pressure storage bullets which can then be used in gas engines for power generation in Well Test sites instead of diesel. CNG can also be transported to power stations in Broome, Derby and other west Kimberley towns to replace LNG trucked from Karratha at present. CNG could also be used in duel-fuel engines for the drilling and HFS operations within the Valhalla E & A Program if equipment with suitable

engine specifications is available locally. At present the sale of gas as CNG is considered unviable due the associated cost of capture, treatment and transportation to markets located far from the Valhalla field.

Figure 4-4: CNG utilisation in duel-fuel engines (Source: GTUIT)

4.5.2 Micro LNG

A relocatable micro-LNG plant could also be used to capture the well head gas (as used in some US shale gas operations) if this equipment were available in the Australian market. The use of micro-LNG option would require the well head gas to be pretreated such that water, CO2 and freezable heavy hydrocarbons are removed from the gas to allow liquefaction of the gas. The LNG produced can then be stored in transportable ISO containers and shipped to markets.

Cryobox™ is a mini-LNG technology and other similar flare gas liquefaction technologies that provides relocatable pre-treatment units as used in US shale gas industry [12].

Figure 4-5: Well head gas capture via Mini-LNG (Source: CryoBox)

At present the sale of LNG to local power stations is considered unviable with existing gas offtake contracts in place with power plant operations and the inability for the project proponents to commit to a fixed volume based LNG supply contract from the gas exploration and appraisal program.

4.5.3 Renewables

The use of renewable energy such as solar PV for powering the drilling and HFS operations are impracticable as significant number of solar panels will be required to be placed over a large area. The solar PV power also need to be supported with large batteries that can store energy to be supplied during the nights. Therefore, resulting in significantly higher costs. Further, the rigs and HFS units need to be re-located to various sites during the drilling program which will make the use of renewable energy impracticable. A better alternative would be to use grid power if available, for the drilling operations, while the grid is supported by renewable power. The Canning Basin and Valhalla region does not have such a grid to support the project. However, solar powered lighting towers with batteries backup are planned to be used in the project as shown in Figure 4-5 along with and other solar power based instrumentation and monitoring systems.

Figure 4-5: GHG Mitigation Measures for the Projects

4.6 GHG Mitigation Summary

The 7-year 20 well Valhalla Gas Exploration & Appraisal program provides the complete scale of the planned drilling and HFS activities associated with the evaluation of the Valhalla formation. Significant part of the GHG emission of an exploration and appraisal drilling program is associated with the well test flow rates and the duration of the well tests. The overall GHG emission estimates are also dependent on the number of wells drilled in Phase I and Phase II of the program with potentially multiple drilling campaigns. The total number of wells drilled will highly depend on the success of each drilling campaign.

The maximum direct emission from the Valhalla E & A program was estimated as 1,597,856 mtCO2e over the 7 years. The following GHG mitigation measures in accordance with the EPA hierarchy of avoid, reduce, offset GHG emissions are discussed below.

4.6.1 GHG Emissions Avoided

By incorporating industry best practice design the following measures were utilized in the Valhalla E & A program to minimize GHG emissions,

(1) Multi-pad Well design: The Valhalla E & A program utlises 2 horizontal wells per well pad to minimize land clearing. The estimated GHG emission avoided is 2,300 tCO2e for the project.
(2) Dual-stack LP/HP Flare: Separate Low Pressure (LP) and High Pressure (HP) flares are used as part of the design to combust tank vapours and well test gas separately ensures any low pressure methane emissions on site is avoided. The estimated GHG emission avoided is 10,000 tCO2e.

4.6.2 GHG Emissions Reduction

The following GHG emission reduction measures are currently being assessed to further reduce project GHG emissions.

(1) Condensate Sale: The sale of condensate produced during the well tests currently being actively pursued by BNR as discussed previously. This would avoid up to 129,943 tCO2e of GHG emissions on site during the project period.
(2) Dual-Fuel Engines: The capture, dehydration, compression and storage of well test gas would allow it to be used in dual-fuel engines reducing the use of diesel and the associated emissions during the drilling and HFS operations. The estimated GHG reduction is around 33,500 tCO2e over the project life.

Further to the above, it is envisaged the well test rates, well testing period and the number of appraisal wells can be reduced with learnings from each drilling/HFS campaign in Valhalla which will significantly reduce gas and condensate flaring and associated emissions.

Figure 4-6 provides a summary of GHG mitigation measures considered part of the GHG reduction exercise.

Figure 4-5: GHG Mitigation Measures for the Projects

The following section provides more details of the GHG offset requirements along with an estimate of GHG estimate for the project.

5 Valhalla E&A Program GHG Emissions v EPA NetZero 2050 Target

The WA EPA has been actively pursuing GHG emissions reduction in the state as the emissions from the state have increased by 11% in the past decade, mainly due to the commissioning of new LNG projects in the northwest of the state. The WA EPA has mandated emissions reduction targets for projects with more than 100,000 tCO2e/year of GHG emissions. The EPA has requested project proponents demonstrate a trajectory of carbon emissions reductions towards NetZero by 2050. Refer to ESD Requirement 78 for Valhalla Project.

5.1 Valhalla NetZero Targets

The two possible Program timelines considered for the Valhalla E & A program are, Timeline #1 - 3 years from 2024 and Timeline #2 – 7 years from 2024 are shown in Figure 5-1 along with the EPA NetZero 2050 trajectory based on the year 2020 baseline set by the EPA. Based on the EPA assessment of exploration phase emissions of a shale gas development, the project would have to either reduce or offset the emission above its target emissions as shown in Figure 5-1 for each of the years of the Valhalla E&A Program.

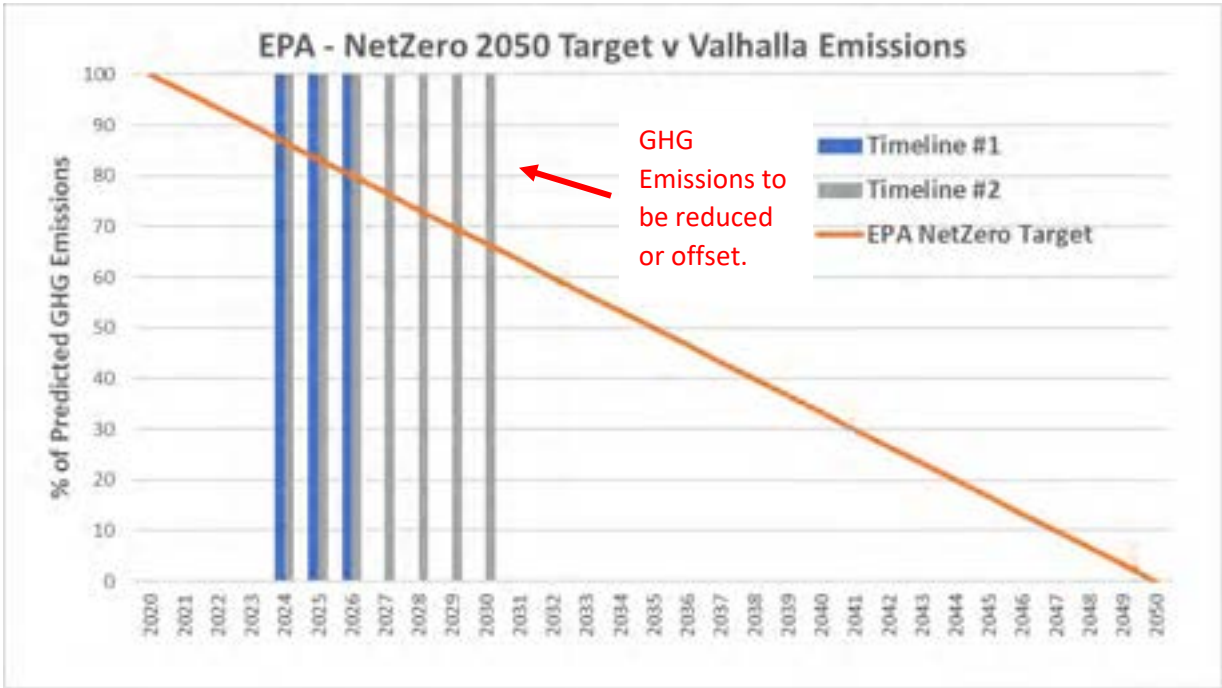


Figure 5-1: EPA NetZero Target v Valhalla Emissions

Table 5-1 provides a quantitative estimate of maximum GHG emissions and the reductions/offsets that could be mandated by EPA under the NetZero 2050 trajectory for the Valhalla E & A program under each of the two timelines considered. Depending on how EPA would assess a shale gas exploration project, BNR may or may not be required to offset part of the GHG emissions associated with the Valhalla E & A program beyond the annual EPA NetZero targets.

It should be noted that the GHG emissions offset/reduction quantities are much less for the optimistic drilling program Timeline #1 from 2024-2026 compared to Timeline #2. Hence, it would be beneficial for BNR to commit to a faster overall development timeline in a NetZero carbon environment.

Year		Timeline #1				Timeline #2			
		No of Wells	Max.Annual Emissions	Reduction Target	Reduced Emissions	No of Wells	Max.Annual Emissions	Reduction Target	Reduced Emissions
			tCO2e	%	tCO2e		tCO2e	%	tCO2e
1	2024	6	314,378	13	41,913	2	104,793	13	13,971
2	2025	7	644,457	17	107,399	2	104,793	17	17,464
3	2026	7	644,457	20	128,879	2	104,793	20	20,956
4	2027					3	276,196	23	64,439
5	2028					3	276,196	27	73,645
6	2029					4	368,261	30	110,467
7	2030					4	368,261	33	122,742
Total		**20**	**1,603,293**		**278,190**	**20**	**1,603,293**		**423,684**

Table 5-1: Annual GHG Emissions and Targeted Emission reduction under EPA NetZero 2050

The EPA NetZero target and the offset/reduction requirement information can be shown below in a graphic form over the two proposed Timelines as show in Figure 5-2 and 5-3 below.

Figure 5-2: Timeline #1 - EPA NetZero Target v Emissions Offsets

Figure 5-3: Timeline #2 - EPA NetZero Target v Emissions Offsets

EPA requires that the project proponents provide compelling reasons for not meeting the NetZero 2050 trajectory. As described in sections 4.5 and 4.6 reasonably practical measures such as sale of condensate and the use of dual fuel engines is currently evaluated and may be undertaken at some point to minimize GHG emissions if appropriate equipment is available and reasonably practicable to apply. This will enable the project to reduce annual emission by around 8-10%. The capture and sale of all well test flow gas is not viable due to a lack of gas markets close by and the unpredictable nature of an exploration and appraisal drilling program which cannot commit to the sale of fixed volumes and time frames unlike in a gas plant. BNR will be required to assess annual emissions and when deemed to have exceeded the EPA NetZero 2050 trajectory targets the project proponents could utilize authorized offsets mechanisms to meet these targets.

5.2 GHG (carbon) Offsets

The EPA advises that where carbon offsets are to be implemented, they should meet offset integrity principles and be based on clear, enforceable and accountable methods. For example, the EPA recognises Australian Carbon Credit Units(ACCUs) issued under the Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth) as meeting these standards. Compliance offsets under the Safeguard Mechanism, as well as voluntary offsets purchased to reduce residual emissions, may contribute to a proponent's Greenhouse Gas Management Plan and will be recognised by the EPA [2].

BNR Climate Change Policy (June 2021) has committed to NetZero by 2050 and the Valhalla E & A Program is committed to progressively reduce emissions over the years to achieve this target. Depending on how EPA would assess a shale gas exploration project, BNR may or may not be required to offset part of the GHG emissions associated with the Valhalla E & A program beyond the EPA NetZero targets via an accredited Australia Carbon abatement program.

5.3 GHG Emissions Reporting

The WA EPA supports the requirements for proponents to periodically report against their interim targets as outline in their GHG Management Plan. EPA prefers this reporting to be aligned with the five-year milestone set out in Article 4 of the Paris Agreement. The EPA will also consider undertaking its own periodic statewide reporting, under section 16(i) of the EP Act, to provide public advice on GHG emissions and the progress of mitigation measures developed and implemented by major proposals within WA [2]. The Valhalla E&A program will meet all state and national GHG emissions reporting requirements.

It should be noted that corporate reporting thresholds for GHG emissions are much lower under the National Greenhouse and Energy Reporting Act 2007 (NGER Act) where 25,000 tCO2 per facility and 50,000 tCO2 per corporate group is mandated.

6 Concluding Remarks

The Valhalla E & A Program GHG emissions estimate was carried out based on the information provided by BNR for the drilling program and the HFS operations. The calculations and other relevant information are provided in a separate spreadsheet (NimblEng Valhalla GHG Emissions Estimate Rev G) as part of this report.

Hydraulic Fracture Stimulation (HFS) or fracking of shale gas formations has been carried out in Australia for over the past 50 years, with over 900 production wells have been fracture stimulated in the Cooper-Eromanga Basin in South Australia and Queensland[13]. Out of the 10,664 CSG wells drilled in Queensland, 8.8 percent have been hydraulically fractured within the Surat and Bowen Basins up until December 2017 [14]. The lifting of the moratorium on HFS in 2019 in Northern Territory has seen projects in the Beetaloo Basin ramp up over the past couple of years under the new Code of Conduct set by the NT Government. Similarly, the WA government is working on introducing its own Code of Conduct for the Shale Gas industry based on the WA Scientific Inquiry on Hydraulic Fracturing. One of the main concerns related to the shale gas industry has been associated with the GHG emissions during exploration, appraisal and development activities of the upstream sector due to the higher number of wells associated with shale gas projects and the flaring associated with the development compared to conventional gas field developments. Therefore, it is essential for the project proponents to tackle this issue early in the project and provide adequate GHG mitigation measures throughout the lifecycle of the project.

The WA EPA Assessment of the Valhalla Gas E & A program will be the first hydraulic fracturing project in WA since the lifting of the moratorium. The Environmental Protection Act process requires that proponents prepare detailed Environmental Impact Assessment (EIA) information that provides the public and regulatory agencies with the data they require to decide on project approval. The Environmental Management Plan (EMP) documents filed by proponents in the Beetaloo Basin in NT EPA over the past 3 years provides good guidance for projects in WA with respect to their EMPs.

The Valhalla E&A program annual emission could range from 100,000 – 600,000 tCO2e per year depending on the number of wells drilled in a year, and the total GHG emissions could range from 1,093,000 to 1,603,300 tCO2e depending on the number of test days utilised per well. In comparison the recently approved Waitsia Stage 2 Gas Project with a 250 TJ/d export capacity has annual emissions of 300,000 tCO2e/y, and the proposed Pluto LNG Train 2 has annual emissions of 1,465,000 tCO2e/yr. Therefore, one would expect EPA to scrutinise the Program's GHG emissions and proposed mitigation measures in detail. The Waitsia Stage 2 Gas Plant Project has committed to offset all CO2 associated with the feed gas from the onset of the project and has committed to further reduce emissions as per the Figure 6-1 in line with EPA's NetZero 2050 trajectory [15]. Woodside's 2 train Pluto LNG facility has committed to reduce or offset emissions in order to meet WA EPA NetZero 2050 target as shown in Figure 6-2 [16].

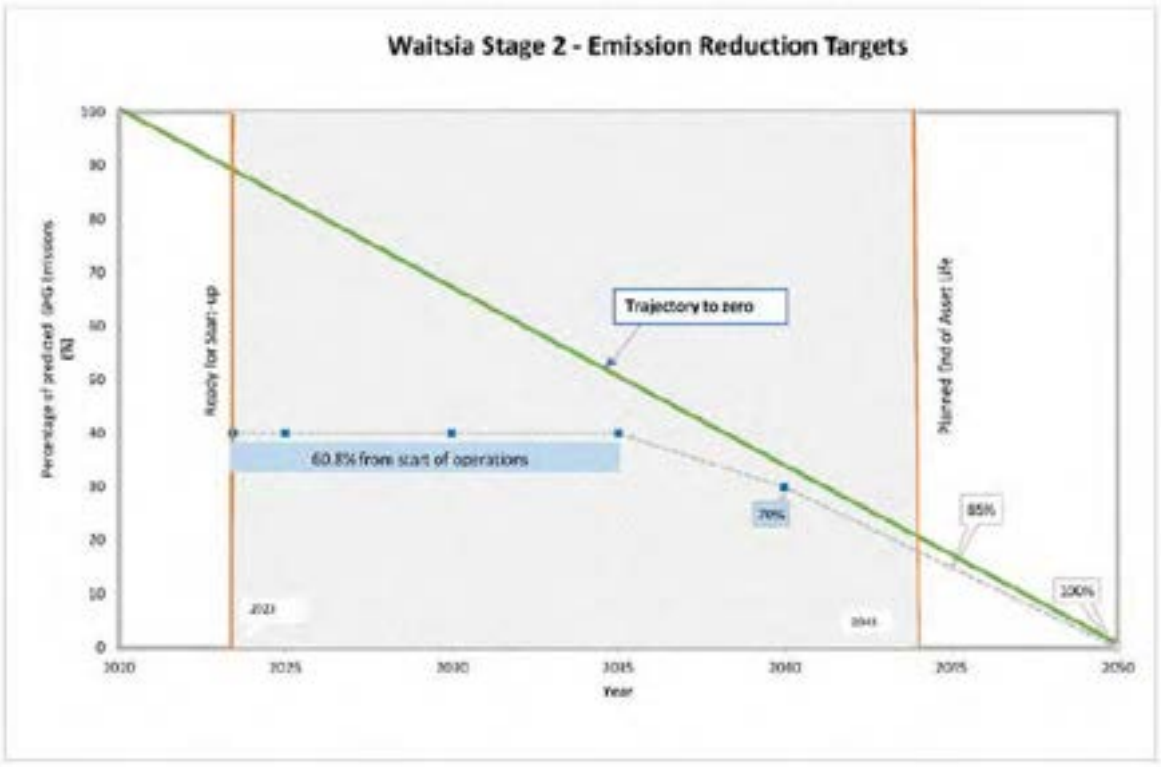


Figure 6-1: Waitsia Stage 2 Gas Plant NetZero Target (Mitsui E &P 2020)

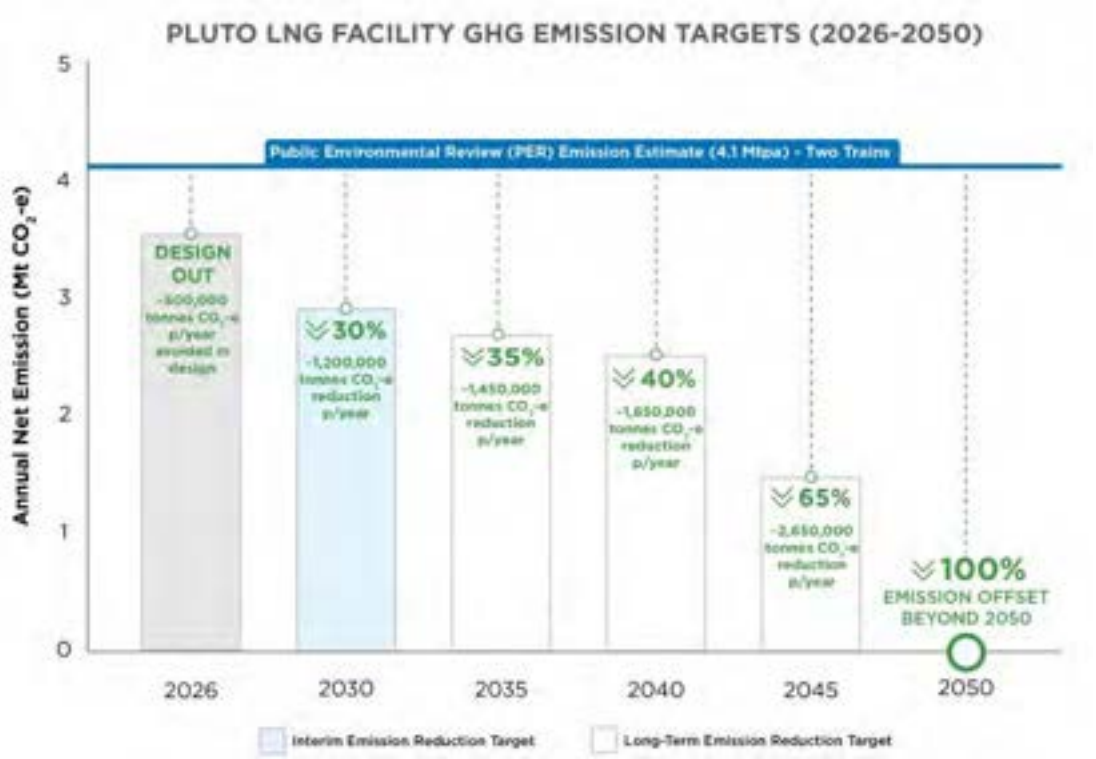


Figure 6-2: Pluto LNG Train 2 NetZero Target (Woodside, 2021)

The nature of an exploration and appraisal program does not allow project proponents to provide firm annual emissions estimate unlike a gas plant or an LNG plant. When developing a gas field, the execution and evaluation of each drilling campaign plays a significant role in subsequent drilling campaigns, number of wells, duration of the well tests and associated GHG emissions. The uncertain nature of the drilling campaigns does not allow project proponents to commit to upfront investment in gas and condensate capture and sales infrastructure from the onset of the exploration program. Therefore the Valhalla project proponents will be required to carefully evaluate capital costs of various capture options and ensure reasonably practical measures are undertaken to reduce emissions as much as possible while providing offsets when EPA NetZero emissions targets are deemed to be exceeded. This is also in line with other project in WA who are drilling conventional exploration and appraisal wells in the state and are currently flaring gas at the exploration phase of their projects. One possible alternative for BNR is to negotiate with EPA and agree to 'carry forward' mechanism for the carbon emissions from the exploration and appraisal phase in full or in part to the production phase and offset these emissions at the later part of the project.

Based on the current maximum flare rates over the 20 well E & A program a volume of nearly 17 bcf of gas and 334,000 bbls of condensate could be flared. At a sale price of 2 $/GJ for gas and 30 $/bbl for condensate puts the value of these hydrocarbons around $ 45 million. The maximum emissions above the EPA NetZero trajectory that requires to be offset could be as high as 423,700 tCO2e over the project life, which at a carbon price of $50/tonne could cost over $21 Million for the project. The Australian Carbon Credit Units (ACCUs) are currently trading at $21/tCO2e and several operators are currently using a carbon price of up to $80/tCO2e as part of their project costs to account for carbon emissions costs. BNR should carefully assess the impact of carbon price for the entire project while evaluating the GHG emissions reduction measures such as capture and utilization of gas as CNG or LNG from the project over the exploration, appraisal and development phase.

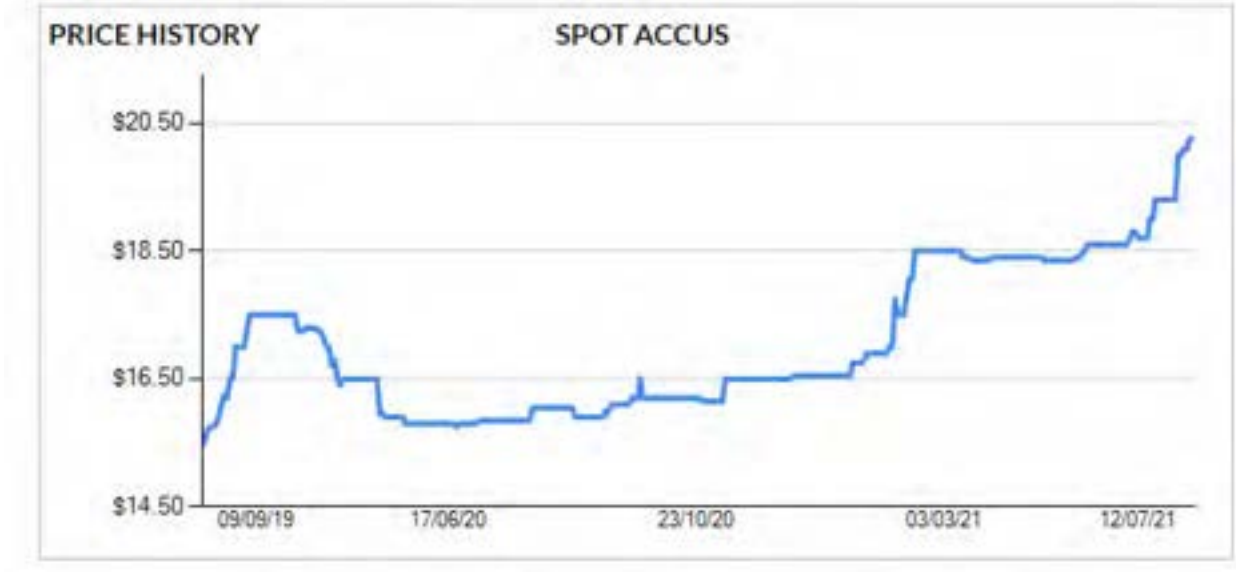


Figure 6-3: Australian Carbon Credit Units Price (July, 2021))

The Western Kimberley region utilises LNG trucked from Karratha (located nearly 1000km away) in Power plants in Broome, Derby and other remote towns. These power plants are operated by Energy

Developments Limited (EDL) who also operate the mini-LNG plant in Karratha to produce and supply LNG via multi-trailer trucks to these power plants. The total gas demand of these power plants range from 6-10 TJ/d. EDL is a potential customer if part of the gas can be captured and sold as LNG at an appropriate price.

The NetZero 2050 target set by the West Australian government has been a challenge for all gas developers in the state. The carbon abatement associated with the shale gas well tests during the exploration, appraisal and development phase of the project creates a bigger challenge in developing the Canning Basin due to the lack of existing gas infrastructure and a pipeline to market. The Canning Basin shale gas project proponents need to look at innovative concepts to capture this gas and get it to market as opposed to flaring at site where economically feasible. This would also help overcome public perceptions and regulatory pressures while providing confidence to the industry in setting a pathway for low-carbon shale gas development in the state. BNR is uniquely positioned to bring their US expertise in developing state-of-the-art low-carbon footprint shale development to Australia compared to other local shale developers.

7 Reference

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Appendix C Third party independent review of the GHG EMP

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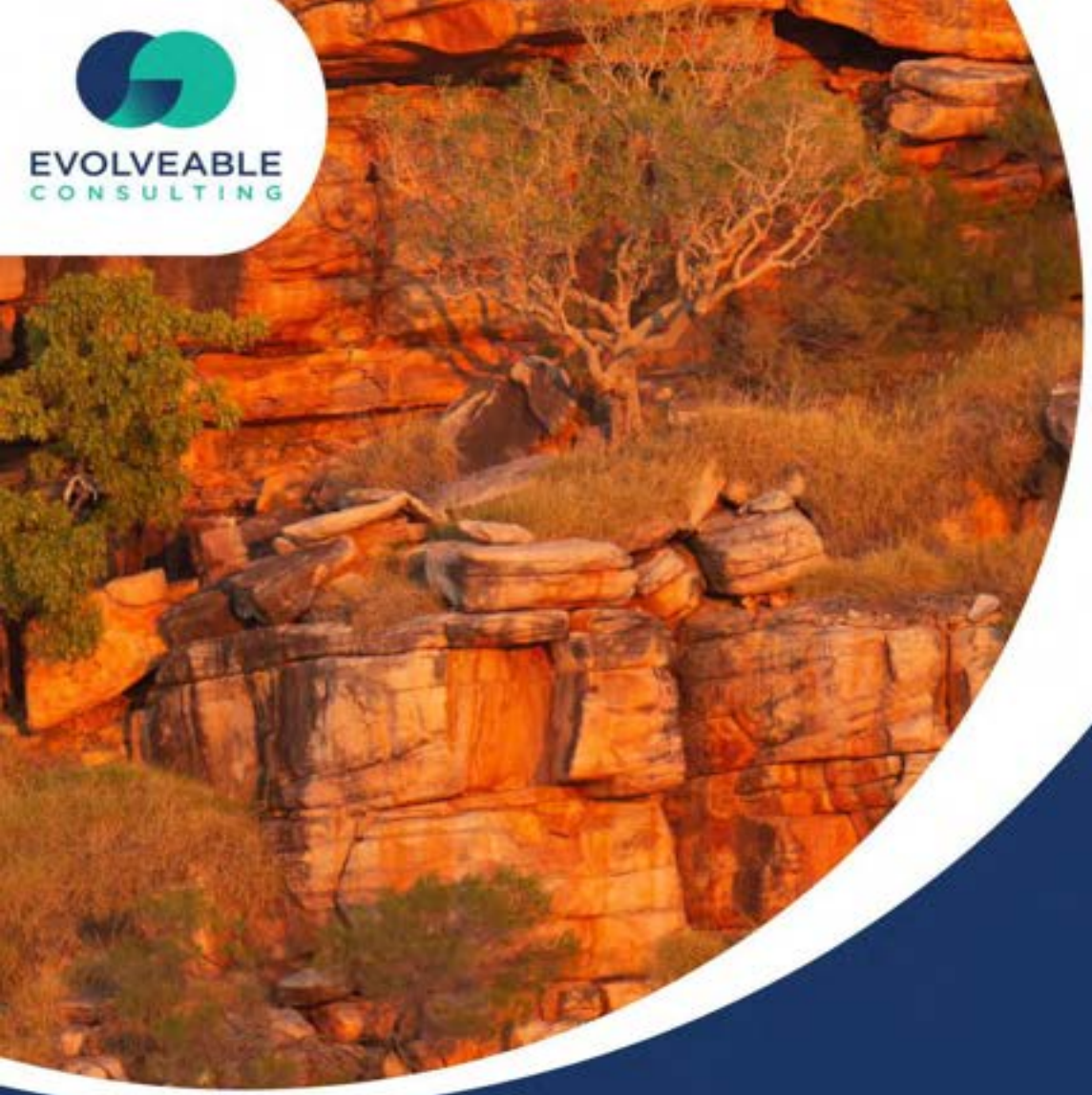

VALHALLA GREENHOUSE GAS ENVIRONMENTAL MANAGEMENT PLAN

EXTERNAL PEER REVIEW

Prepared for:

AES

Peer Review Completed: June 2024

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Acronyms

Acronym	Description
ACCU	Australian Carbon Credit Units
AES	Australasian Environmental Solutions
BNR	Bennett Resources
CO_{2e}	Carbon Dioxide Equivalent
EP	Exploration Permit
EPA	Environmental Protection Authorities
GHG	Greenhouse Gas
GHG EMP	Greenhouse Gas Environmental Management Plan
HFS	Hydraulic Fracture Stimulation
MMcf/d	million cubic feet per day
TJ/day	Terajoule per day

Addendum to Peer Review Report

10th June 2024

Following the submission of the Valhalla Greenhouse Gas Emissions Management Plan (GHG EMP) Peer Review Report Revision 0 to Australasian Environmental Solutions (AES), the peer review process identified several recommendations.

AES thoroughly examined these recommendations and has since issued Revision 4 of the GHG EMP, which addresses the original Peer Review recommendations.

A subsequent review of additional information has been performed on the GHG EMP, the findings of which are encapsulated in the following summary.

This addendum documents the iterative process of review and refinement undertaken to ensure the GHG EMP's alignment with best practices and regulatory standards.

Recommendations	GHG EMP Rev 4 Peer Review
Emission targets: Increase Valhalla GHG EMP interim target to 43% reduction of baseline by 2030 to align with Commonwealth targets rather than the historical 28%.	Emission targets throughout the GHG EMP have been updated from 28% to 43%.
Methane monitoring: Given the duration of this program and the number of wells proposed, the GHG EMP should consider utilising methane detection technologies to verify ambient-level methane across the project locations after the completion of the exploration and appraisal program.	Under Section 5 of the GHG EMP, Table 5-2 demonstrates a commitment to methane monitoring after the completion of the Proposal if methane levels are above the detection limit of 3.3 mg/m^3.
Offset location and type: Provide further detail on the preferred location or types of offsets that will be utilised to satisfy any emission liabilities.	The GHG EMP has been updated to include Section 3.11, preferred offsets and availability. This section provides detail on: • Estimated volumes of offsets • Preferred type of offsets • High-level assessment of near-term offset volume forecasts.
Offset availability: The GHG EMP should include an assessment of offset availability relevant to the worst-case potential emission liabilities and forecast market availability out to 2030.	

Basis of Conclusion

The additional information in the updated Revision 4 of the Valhalla GHG EMP addresses the identified recommendations in the Valhalla GHG EMP Peer Review Report Revision 0.

1 Introduction

Australasian Environmental Solutions engaged Evolveable Consulting Pty Ltd to perform an independent peer review of the Bennett Resources (BNR) Valhalla Greenhouse Gas Environmental Management Plan (GHG EMP) per the Western Australian Environmental Protection Authorities (EPA) *Environmental Factor Guideline: Greenhouse Gas Emissions*.

1.1 Scope

The scope of the peer review is to:

- Review emission calculations.
- Assess the demonstration of best practices relevant to the project scope.
- Review industry benchmarks, and
- Review offset liabilities and plans to satisfy (integrity and availability).

1.1.1 Project context

The project under review involves an unconventional exploration and appraisal drilling program, coupled with Hydraulic Fracture Stimulation (HFS), within the confines of Petroleum Exploration Permit EP 371 in the Canning Basin, located in the Shire of Derby/West Kimberley, Western Australia.

The primary objective of this proposal is to assess the substantial tight gas reserves anticipated in the area. Should the exploration efforts yield a petroleum resource, testing to ascertain the quality and volume of gas within the well will be necessary. The outcomes of these tests are crucial as they will inform the company's decision-making process regarding the commercial viability of the reserves.

The project is time-bound, considering the exploration and appraisal activities. Each well represents a unique emissions event, distinct from those associated with continuous operations related to a production phase. This delineation and context are essential as they underpin the practicality of implementing best practice technologies throughout the exploration and appraisal program.

1.2 Documentation Reviewed

As part of this process, the following documentation was reviewed:

- Bennet Resources, Valhalla Gas Exploration and Appraisal Program Greenhouse Gas Environmental Management Plan, Rev 4, BNR_HSE_MP_014
- GHG EMP Supporting documentation:
    - Data and calculations – Valhalla GHG Estimates_Rev G
    - Valhalla Exploration Program GHG Management Report Rev0
    - Appendix H.1 – Valhalla Air Quality and GHG Monitoring Report

- Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia Final Report to the Western Australian Government September 2018
- Government of Western Australia, Position Paper, Monitoring, mitigation and offsetting of Greenhouse Gas Emissions for hydraulic fracturing proposals in Western Australia.
- Northern Territory government, Code of Practice: Onshore Petroleum Activities in the Northern Territory
- United States Natural Gas STAR Program
- International Petroleum Industry Environmental Conservation Association. (2014, February 1). Green completions.
- Government of Australia's 2008 National Greenhouse and Energy Reporting (Measurement) Determination
- American Petroleum Institute's 2009 Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry

2 Emission and Target Review

2.1 Emission Estimates

As part of this review, the emissions quantifications were reviewed to ensure alignment with the requirements of the EPA *Greenhouse Gas Emissions Factor guideline*.

Section 3.1 of the GHG EMP outlines the emissions estimates for the project. This review concentrates on the material emission sources, gas and condensate flaring, which account for over 90% of the total project emissions.

A review of both calculations and assumptions was performed.

2.1.1 Scope 1

The emissions data and associated assumptions that formed the basis of the GHG EMP are consistent with recognised industry best practices in emissions accounting. Scope 1 and 3 emissions have been quantified using primarily:

1. Government of Australia's 2008 National Greenhouse and Energy Reporting (Measurement) Determination
2. American Petroleum Institute's 2009 Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry

The duration of exploration and appraisal activities will vary well to well. The GHG EMP provides a 60-day and 90-day well range, which covers a minimum and maximum scenario to cover this uncertainty.

The project is split into two phases, with Phase One maximum emissions estimated to be < 200,000 tonnes CO_{2e} per year and Phase Two maximum emissions estimated to be < 600,000 tonnes CO_{2e} per year. The total emission estimated for the exploration and appraisal program is 1,603,293 tonnes of CO_{2e}.

The methodology applied aligns with that specified within the Western Australian Government Position Paper on monitoring, mitigation and offsetting of Greenhouse Gas Emissions for hydraulic fracturing proposals in Western Australia in the context of exploration and appraisal program; as such, it does not estimate emissions for potential future operations.

2.1.2 Scope 2

Section 3.1.2 of the GHG EMP specifies that the exploration and appraisal program will operate independently without importing power from external sources; as such, there are no Scope 2 emissions.

2.1.3 Scope 3

The base case for the GHG EMP is that there will be no Scope 3 emissions as all produced fluids will be combusted via the flare.

The GHG EMP presents an alternate option that the proponent is considering: selling condensate produced during the well testing program to external parties, thereby reducing Scope 1 emissions associated with the condensate portion (approximately 129,000 tonnes CO_{2e}). This is a common practice in other regions where supporting infrastructure is readily available near the exploration site location, and demand for the condensate product exists.

Scope 3 estimates for this scenario have been estimated utilising the Government of Australia's 2008 National Greenhouse and Energy Reporting (Measurement) Determination.

Although this alternate scenario would directly reduce Scope 1 emissions, the end use of the condensate product is likely the same. When this end use is combined with transportation of the condensate between the site location and third party, the net emissions of this alternate scenario will increase compared to the base case.

2.2 Emission Targets

Section 3.3 of the GHG EMP proposes emission reduction targets that align with the historical Australian Commonwealth emission target of 28% below 2005 levels by 2030. Given Australia's increased commitment in 2022 to achieve 43% below 2005 levels by 2030, it is recommended that BNR align their commitment to the Commonwealth Government at a minimum.

Recommendation: Increase Valhalla GHG EMP interim target to 43% reduction of baseline by 2030 to align with Commonwealth targets.

3 Best Practice Review

A desktop literature review was conducted to gain insight into the best practices within the onshore gas exploration and appraisal industry in Western Australia and nationally.

International guidance was leveraged to understand best practices relevant to exploration and appraisal well greenhouse gas measures.

A summary of key guidance documents reviewed to inform this peer review is provided in Table 1.

TABLE 1: LITERATURE REVIEW OF EMISSION MITIGATION STRATEGIES IN ONSHORE PETROLEUM OPERATIONS

Guidance Document	Summary
Government of Western Australia: Monitoring, mitigation and offsetting of Greenhouse Gas Emissions for hydraulic fracturing proposals in Western Australia	This paper explains the State Government's position regarding implementing the Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia's (the Inquiry) recommendations for monitoring, mitigating, and offsetting greenhouse gas emissions from hydraulic fracturing proposals in Western Australia. Five key guiding principles are outlined, including the consideration of exploration activities. Since this paper was published, the Environmental Protection Authority has released further guidance on greenhouse gas emissions.
Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia Final Report to the Western Australian Government September 2018	Section 10.9 of the Inquiry Report discusses Green Completions, specifically Recommendation 12, which acknowledges that reduced (greens) emissions completions should be a requirement apart from the early exploratory phase of development. Section 10.10 states that GHG emissions from the exploration phase of unconventional gas exploration present a negligible environmental risk, even without reduced emission completions.

Northern Territory government, Code of Practice: Onshore Petroleum Activities in the Northern Territory. Link: Code of practice: Onshore petroleum activities in the Northern Territory	The Code of Practice for Onshore Petroleum Activities in the Northern Territory provides a framework for ensuring environmentally responsible petroleum operations within the region.
United States, Natural Gas STAR Program. Link: https://www.epa.gov/natural-gas-star-program/reduced-emission-well-completions-and-workovers	This initiative offers strategies for reduced emission well completions and workovers, aiming to minimise the environmental impact of natural gas operations.
IPIECA. (2014, February 1). Green completions. Link: https://www.ipieca.org/resources/energy-efficiency-solutions/units-and-plants-practices/green-completions-2014/	This resource offers insights into energy-efficient solutions for green completions in the oil and gas industry.

The review of best practice guidance indicates substantial opportunities for emission reductions throughout the well development phase and subsequent production and operational stages. However, it is recognised that the emission reduction opportunities for exploration and appraisal are somewhat constrained due to various factors, including, but not limited to:

- Site location
- Lack of pre-existing infrastructure, such as gas transmission networks.
- The regional context of the operations.

3.1 Scope 1

Section 3.4.1 of the GHG EMP summarises potential emission reduction opportunities, which was informed by a detailed study, the Valhalla Gas Exploration Program GHG Management Report.

This report reviewed national and international sources for information on industry best practices. It considered each of the proposed emission reduction opportunities in the context of the Valhalla Exploration and Appraisal program, including site location constraints, regional context, and regulatory regime. In addition, it considered the findings of the Western Australian Hydraulic Fracking Inquiry Report.

A total of nine emission reduction opportunities are identified for the project. Of the nine, four have been selected to reduce Scope 1 emissions. These are:

- Well design – Horizontal vs Vertical

- Flaring versus venting
- Selection of efficient diesel generators
- Renewables (lighting towers)

Condensate capture for sale or other use has been identified as an opportunity under consideration; however, the lifecycle perspective has been considered and presented within the GHG EMP. Whilst this presents an opportunity to reduce Scope 1 emissions, it shifts the emissions to Scope 3 while adding further transportation emissions. Additional details on this are provided in Section 3.2.3.

Three emission reduction opportunities were identified but not progressed due to commercial or technical feasibility. These were:

- Renewables for power generation
- Compressed Natural Gas
- Micro Liquified Natural Gas

Conclusion:

- The emission reduction opportunities proposed within the GHG EMP for exploration and appraisal activities align with national and international industry best practices when considering the project-specific context.

3.2 Scope 2

There are no Scope 2-related emissions on this project.

3.3 Scope 3

The project's base case scenario assumes no scope 3 emissions related to the consumption of gas and condensate, and test fluids will be flared onsite.

As detailed in Section 2.1.3 of this review, if the condensate portion of well test fluids is separated and captured, it could be utilised; however, considering the emissions related to the transport of these fluids combined with a similar end use, this would increase the project's net emissions.

3.4 Monitoring

A baseline GHG monitoring assessment was undertaken in 2021 to satisfy the requirements of the Monitoring, mitigation, and offsetting of GHG Emissions for hydraulic fracturing proposals in Western Australia. This evaluation included baseline methane measurements at three sites, with results below the detection threshold of 6.6 milligrams.

The GHG EMP Table 5-1 and Table 5-2 commit to monitoring the direct activity-related emissions but not ongoing monitoring of the broader ambient environment.

With technological advancements in methane detection in recent years, various cost-effective methods are now accessible for frequent monitoring of methane concentrations throughout the project area during operational activities.

The Code of Practice for Onshore Petroleum Activities in the Northern Territory outlines the routine periodic atmospheric monitoring programme requirements, including specific methane monitoring requirements prior to the exploration and production phases.

Recommendation: Given the duration of this program and the number of wells proposed, the GHG EMP should consider utilising methane detection technologies to verify ambient-level methane across the project locations after the completion of the exploration and appraisal program.

3.5 Industry Benchmarking

Section 3.2 of the GHG EMP provides a summary of industry benchmarking analysis. This section compares five analogous projects within Australia, evaluating them based on emissions intensity and total emissions per well.

For further context to support the peer review, international projects were reviewed by examining flow rate performance from comparable global developments to support the benchmarking context.

The benchmarking reveals that in emissions intensity—measured in tonnes of CO_2 equivalent (CO_{2e}) per well per day, Valhalla Phase 1 and Phase 2 exhibit the highest values among the projects evaluated. This higher intensity reflects the anticipated flow rates of the Valhalla project wells over a shorter duration (days) than other programs.

When analysed on a per-well basis, measured in total emissions per well, Valhalla Phase 1's potential maximum emission volumes align closely with those of the other projects. However, the emission volumes for Valhalla Phase 2 wells surpass the comparative projects for the minimum and maximum projected cases, attributed to the higher expected flow test rates due to reservoir properties.

Tamboran Resources has recently concluded an exploratory campaign in the Beetaloo Basin of the Northern Territory, identified as the Origin Energy Velkerri wells, as delineated in the GHG EMP. The appraisal of the SS-1H well yielded a flow rate of 2.9 million cubic feet per day (MMcf/d)[1], which, when normalised over a distance of 1,000 meters, equates to 5.8 MMcf/d. The original Origin Valkerri Greenhouse Gas Management Plan estimated a 2.5 TJ/day flow rate.

For the Valhalla wells, the proposed flow rates are estimated to be similar to the Tamboran Resources well in Phase 1 (5.9 MMcf/d) and approximately double in Phase 2 (10.7 MMcf/d).

[1] ASX announcement: Tamboran Resources Corporation, April 2024

This highlights the influence of expected well rates relative to emissions in exploration and appraisal activities.

As stated in Section 3.1 of this document, nine emissions reduction strategies have been evaluated, with several selected for implementation to reduce Scope 1 emissions.

4 Offset Integrity and Availability

In accordance with the EPA *Environmental Factor Guideline - Greenhouse Gas Emissions,* a review of the GHG EMP Offset commitments has been completed as part of this review.

Due to the project being exploration and appraisal, the volume of emissions will be proportional to the flaring durations required to gain sufficient data to understand the reservoir. The GHG EMP has set targets regarding emissions; if these are exceeded, this will trigger offset liabilities for the project.

A review of GHG emission calculations and targets estimates that the project's offset liabilities could be greater than 400,000 tonnes CO_{2e}.

The recommendation identified in Section 2.2 of this document regarding increasing the interim target to align with Australia's commitment may impact the number of offsets required for this proposal.

4.1 Offset Integrity

Section 3.9 of the GHGEMP has set the following offset integrity criteria.

- Australian Carbon Credit Units (ACCUs) issued under the Commonwealth Carbon Credits (Carbon Farming Initiative) Act 2011
- eligible offsets under the standard Climate Active Carbon Neutral Standard for Organisations (Climate Active 2020), in addition to ACCUs, include:
    - verified emission reductions issued under the Gold Standard
    - verified carbon units issued under the Verified Carbon Standard
    - Certified emissions reductions are issued per the Kyoto Protocol rules from Clean Development Mechanism projects.
    - removal units issued by a Kyoto Protocol country on the basis of land use, land use change and forestry activities under Article 3.3 or Article 3.4 of the Kyoto Protocol.

No details on the preferred location or types of offsets are provided within the GHG EMP.

Recommendation: Provide further detail on the preferred locations or types of offsets that will be utilised to satisfy any emission liabilities.

4.2 Offset Availability

The GHG EMP does not estimate potential liabilities due to the uncertain nature of exploration and appraisal activities. However, based on a review of calculations, liabilities could be greater than 400,000 tonnes CO_{2e} in a worst-case emissions scenario for the project.

No assessment relevant to the availability of offsets has been completed within the GHG EMP; however, in Section 3.9 of the GHG EMP BNR commits that where and when required, they will acquire carbon offsets that meet the contemporary Australian acceptability standards (e.g., they should meet offset integrity principles and be based on transparent, enforceable, and accountable methods).

Based on a review of ACCU volumes estimated for 2024, sufficient offsets will likely be available in the near term. However, the process for assessing this availability is not evident within the GHG EMP.

Recommendation: The GHG EMP should include an assessment of offset availability relevant to the worst-case potential emission liabilities and forecast market availability out to 2030.

5 Summary

Basis of Conclusion

We believe the evidence we have obtained is sufficient and appropriate to provide a basis for the conclusion regarding:

- Emissions quantification: The methodology and assumptions utilised to estimate emissions align with good emissions accounting practices.
- Demonstration of best practice: The scope 1 emission reduction opportunities assessed within the GHG EMP for exploration and appraisal activities align with both national and international industry best practices relevant to the context of the project based on the literature review performed.
- Offset integrity: BNR have committed to reputable carbon offset integrity standards within the GHG EMP.

Recommendations:

- Emission targets: Increase Valhalla GHG EMP interim target to 43% reduction of baseline by 2030 to align with Commonwealth targets rather than the historical 28%.
- Methane monitoring: Given the duration of this program and the number of wells proposed, the GHG EMP should consider utilising methane detection technologies to verify ambient-level methane across the project locations after the completion of the exploration and appraisal program.
- Offset location and type: Provide further detail on the preferred location or types of offsets that will be utilised to satisfy any emission liabilities.
- Offset availability: The GHG EMP should include an assessment of offset availability relevant to the worst-case potential emission liabilities and forecast market availability out to 2030.

We have:

- Used our professional judgement to assess the GHG emission quantification methodology for the Project along with the proposed emission reduction opportunities.
- Considered credible external literature sources to inform our basis for best practice mining design and operations and
- Ensured that the review team possessed the appropriate knowledge, skills and professional competencies.

Use of this Peer Review Report

This report has been prepared for AES to provide a conclusion on demonstrating best practice, offset integrity, and availability, but it may not be suitable for any other purpose.

This Peer Review is based on our current understanding and knowledge, which may evolve, and we make no express or implied representations or warranties regarding the accuracy or completeness of the conclusions in this report. We disclaim any assumption of responsibility for any reliance on this report.

Statement of independence, impartiality and competence

Evolveable Consulting is an independent environmental engineering company specialising in decarbonisation, sustainability, and circular economy services.

No team member has a business relationship with BNR, beyond that required of this assignment. Evolveable Consulting conducted this review independently, and to our knowledge, there has been no conflict of interest.

The review team has extensive experience conducting assurance reviews of engineering designs, environmental information, systems, and processes.

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Appendix S. Subterranean Fauna Desktop Study

Bennelongia Environmental Consultants

Valhalla Gas Exploration and Appraisal Program Subterranean Fauna Desktop Assessment

Prepared for:

Bennett Resources Pty Ltd

November 2023

Short-Range Endemics | Subterranean Fauna

Waterbirds | Wetlands

Valhalla Gas Exploration and Appraisal Program Subterranean Fauna Desktop Assessment

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EXECUTIVE SUMMARY

Bennett Energy Pty Ltd proposes to develop the Valhalla Gas Exploration and Appraisal Program (hereafter the Project) approximately 55 km west of Fitzroy Crossing, Western Australia. The focus of the Project is to extract hydrocarbons from 2,000-4,000 metres below ground level (mbgl). However, some abstraction of groundwater will be required for construction and other purposes from two shallow wells (or bores) at each of the 10 drill pads where deep wells will be installed. Bennett Energy commissioned Bennelongia Environmental Consultants to undertake desktop assessment of subterranean fauna values around the Project in relation to this abstraction of groundwater.

The databases of the Western Australian Museum and Bennelongia, as well as environmental reports for nearby mining projects and scientific literature, were searched for records of subterranean fauna within a 100 x 100 km square around the Project.

Although there has been little sampling of subterranean fauna in the desktop search area, up to 21 species of stygofauna and at least seven species of troglofauna have been collected. Many of the records have been from limestone caves north of the Project but stygofauna has been recorded in geologies similar to that of the Project area. Stygofauna occurs in the surficial aquifers of the Fitzroy Trough, quite likely in richer communities than current data suggest. More generally, the Kimberley is known to support moderate stygofauna communities, while to the south communities in the Pilbara are rich. Little is known about troglofauna in the Kimberley.

The Project proposes to abstract a maximum volume of 33,400 kL per well over a six-month period. Modelled drawdown in the shallow aquifer is small, being less than 1 m beyond 56 m from each bore. Thus, it is unlikely that drawdown will have negative impacts on stygofauna conservation values. Drawdown would also have no negative impact on troglofauna, if these animals are present.

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1. INTRODUCTION

Bennett Energy Pty Ltd proposes to develop the Valhalla Gas Exploration and Appraisal Program (hereafter the Project) approximately 55 km west of Fitzroy Crossing, Western Australia (Figure 1). The unconventional drilling program proposes drilling up to 20 wells across 10 well sites within a previously explored area of Petroleum Exploration Permit EP 371 in the Canning Basin (Bennett Resources 2020). The Development Envelope encompasses 109 ha and the target hydrocarbons lie 2,000-4,000 metres below ground level (mbgl). Pumping of 33,400 kL per well over 6 months has been modelled, with drawdown of 1 m at a distance of 56 m from each well; recovery is expected within weeks following the cessation of pumping (Rockwater 2016).

Recognising the potential for Project development to affect subterranean communities, Bennett Energy commissioned Bennelongia Environmental Consultants to undertake desktop assessment of subterranean fauna values around the Project. In accordance with established guidelines (EPA 2016, 2021), the objectives of this report are:

- To collate records of subterranean animals from the proposal area and surrounds to determine the types of subterranean fauna present;
- To determine the conservation status of the subterranean species recorded and the known distribution of any conservation-significant species; and
- To estimate the likely impact of mining activities on subterranean fauna based on groundwater flow, direction, connectivity, and drawdown.

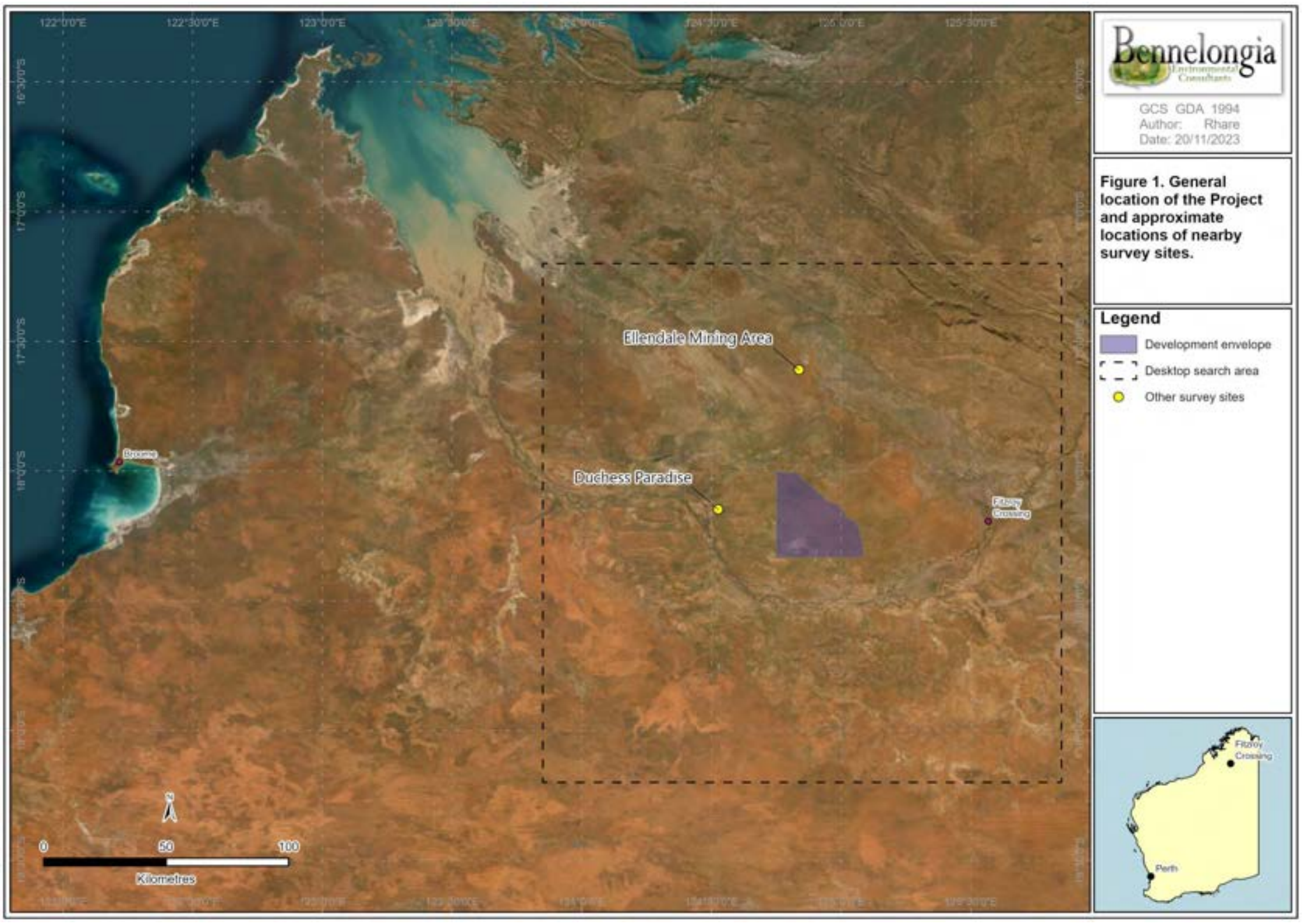
1.1. Climate, Geology, and Hydrogeology

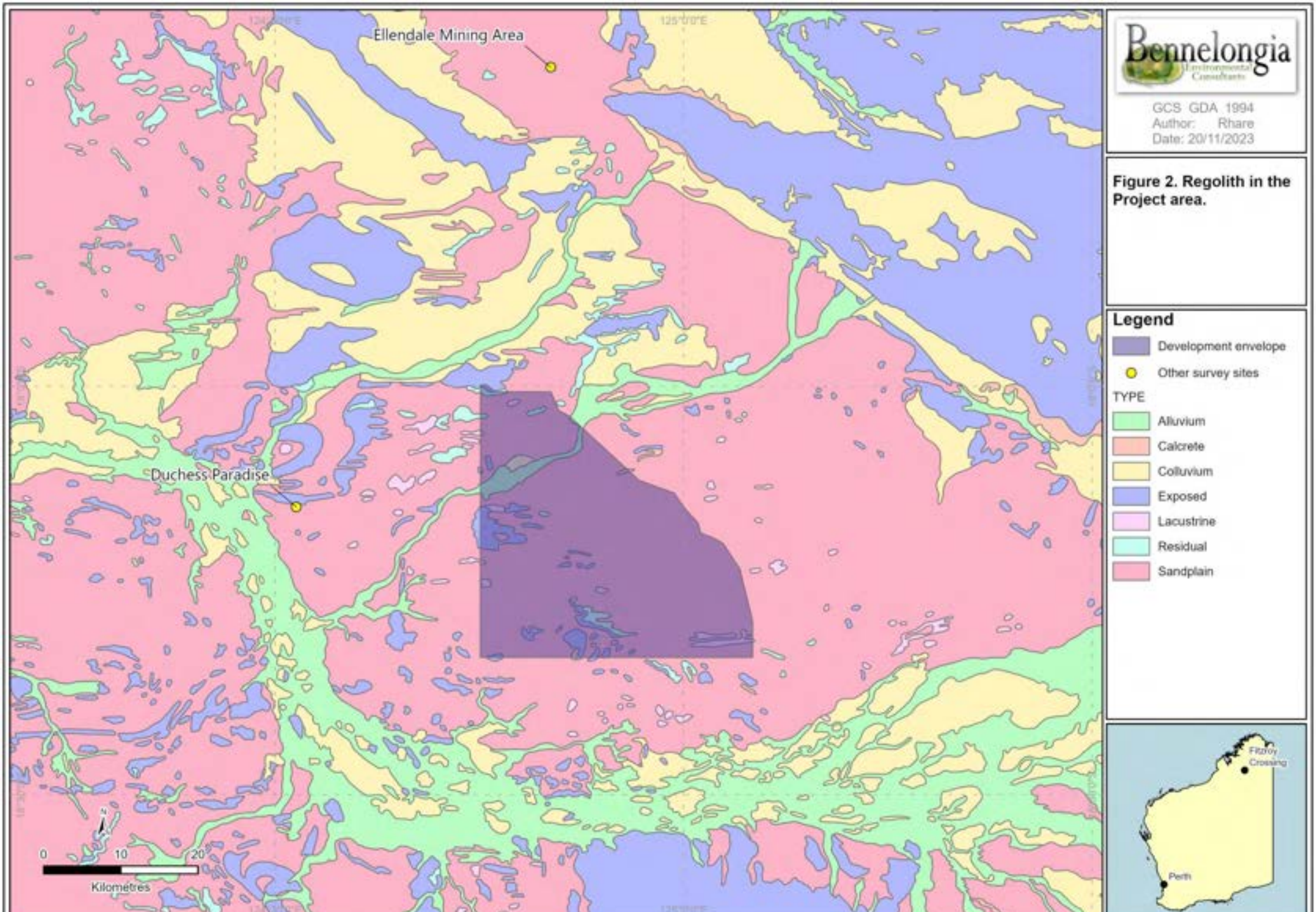
The climate at the Project is tropical, with hot wet summers and warm dry winters. The nearest weather station (Ellendale, BOM site number 003008; 17.93°S, 124.81°E) reports an annual mean rainfall of 614.8 mm concentrated in January (168.2 mm) and February (155.7 mm), although annual rainfall ranges from 211.7 mm to 1,409 mm (Bureau of Meteorology 2023). Monthly maximum temperatures at Fitzroy Crossing (18.18°S, 125.56°E; data not available for Ellendale) are highest in November (40.9°C) and lowest in Jun (30.6°C). Evaporation exceeds rainfall (Rockwater 2016).

The Canning Basin is the second largest groundwater source by volume in Australia, following the Great Artesian Basin (Rockwater 2016). It spans 430,000 km^2 and its yield is estimated at 615,000-827,000 ML/yr. Geologically the basin is early Ordovician to early Cretaceous in age.

The proposed wellfield falls within the Fitzroy Trough, a north-west trending graben constituting a major subdivision of the Canning Basin. The Fitzroy Trough is approximately 110 km wide and is bounded by the Beagle Bay fault on the north-east and the Fenton Fault on the south-west. Geology in the trough is characterised by strata of aquifers and/or aquitards, beginning with the siltstone, shale, and sandstone Liveringa Formation at the surface and progressing through shale, sandstone, and siltstone aquifers/aquitards to the Laurel Formation; permeability and porosity decrease with depth. The surficial Liveringa Formation is middle-to-late Permian in age and exposed at the surface around the Project. The Laurel Formation hosts the target hydrocarbons and comprises limestone, shale, siltstone, and sandstone; it is a minor aquifer or aquitard 2,000-4,000 mbgl (Rockwater 2016).

Depth to the water table ranges from 30-36 m. This is a depth at which the richness of stygofauna communities usually declines substantially as a result of reduced inputs of nutrients and cardon from the surface. Groundwater in the more surficial formations is recharged by rainfall, a process slowed by fine-grained sediments throughout the Fitzroy Trough. Groundwater flow is westerly with discharge into the Fitzroy River (102 ML/d; INTERA 2023); the flow travels approximately 3 km in 500 years (Rockwater 2016). Groundwater is fresh (200 mg/L TDS) to brackish (1,000 mg/L TDS) in the surficial formations, but increasingly saline from 1,500 mbgl, and >70,000 mg/L TDS in the lowermost formations


Bennelongia
Environmental Consultants
GCS GDA 1994
Author: Rhare
Date: 20/11/2023
Figure 1. General location of the Project and approximate locations of nearby survey sites.
Legend
Development envelope
Desktop search area
Other survey sites
Ellendale Mining Area
Duchess Paradise
Broome
Fitzroy Crossing
Perth
0
50
100
Kilometres


Ellendale Mining Area
Duchess Paradise
0
10
20
Kilometres
Bennelongia
Environmental Consultants
GCS GDA 1994
Author: Rhare
Date: 20/11/2023
Figure 2. Regolith in the Project area.
Legend
Development envelope
Other survey sites
TYPE
Alluvium
Calcrete
Colluvium
Exposed
Lacustrine
Residual
Sandplain
Fitzroy Crossing
Perth

(Rockwater 2016). In general stygofauna communities can be rich in salinities up to 25,000 mg/L, although few species in north-western Australia occur in water >10,000 mg/L (Halse 2018).

1.2. Subterranean Fauna Framework

The term subterranean fauna refers to animals living essentially full-time underground. Subterranean animals are divided into two types: stygofauna are aquatic animals that live below ground in water, while troglofauna are air-breathing animals that live underground and require very high humidity (Gibson *et al.* 2019). Stygofauna inhabit vugs, fissures, and interstitial spaces in groundwater aquifers, especially those in alluvium and calcretes. Troglofauna inhabit similar spaces above the water table but with more emphasis on vugs, fissures, and relatively large interstitial spaces.

Subterranean species share several convergent adaptations to life underground where it is dark and resources are limited. These include worm-shaped bodies, elongated chemosensory apparatus, loss of wings, transition towards K-selected breeding strategies, and the loss of skin colouration and eyes (Gibert and Deharveng 2002). Western Australia supports a particularly rich subterranean fauna outside caves (Humphreys 2000; UNESCO World Heritage Centre 2022), with estimates of over 4,000 species, 90% of which remain to be described (Guzik *et al.* 2011; Halse 2018a). Almost all subterranean animals in Western Australia are invertebrates, but fishes (Whitely 1945) and one snake (Aplin 1998) have also been recorded. Most subterranean species are inconspicuous, but contribute substantially to biodiversity and other values, for example by moderating groundwater quality (Hose and Stumpp 2019).

The distribution of subterranean animals is largely determined by prevailing lithology. In Western Australia, subterranean animals probably mostly occupy spaces only a few millimetres in width (Halse 2018a, b; Halse *et al.* 2018) but the key characteristics of their habitat(s) is that it is rich in such spaces (e.g. interstices in alluvium, screen, and voids; vugs, cavities, and fissures in consolidated geologies) and that the spaces are well connected laterally and vertically. Lateral connectivity facilitates dispersal of animals, while vertical connectivity ultimately to the surface is crucial for delivering carbon and other nutrients to subterranean ecosystems (Korbel and Hose 2011). Connectivity may be disrupted by a range of factors, including dykes, major landscape features, and chemical barriers.

Subterranean animals tend to have limited distributions. Most stygofauna species exhibit short range endemism (SRE), having substantially smaller ranges than Harvey's (2002) SRE criterion of 10,000 km^2 (Cooper *et al.* 2007; Cooper *et al.* 2002; Eberhard *et al.* 2009). The ranges of troglofauna have yet to be investigated in detail but are mostly even more restricted than those of stygofauna, with many species having linear ranges less than 10 km (Halse and Pearson 2014; Lamoreux 2004). Given that species with small ranges are more vulnerable to extinction following habitat degradation than wider ranging species, it follows that subterranean taxa are highly susceptible to anthropogenic threats, particularly large-scale excavation and groundwater abstraction (Halse 2018a; Ponder and Colgan 2002).

Stygofauna

Most stygofauna species in Western Australia are crustaceans, particularly ostracods and copepods, although other groups such as worms and beetles are sometimes abundant (DEC 2009; DPAW 2022; Matthews *et al.* 2019). The most productive known stygofauna habitats are saturated alluvial and calcrete aquifers associated with palaeochannel deposits, but stygofauna also inhabit karstic limestones, hyporheic zones, groundwater-fed springs, and aquifers in some iron formations, especially channel iron (Halse 2018b; Hyde *et al.* 2018). Stygofauna are rarely abundant where depth to the water table is more than 30 m below ground level (Halse 2018a; Halse and Pearson 2014). Aquifers with higher transmissivity are more likely to host stygofauna than aquifers with lower transmissivity (Maurice and Bloomfield 2012). Stygofauna mostly occur in fresh to hyposaline water (Halse *et al.* 2014; Humphreys *et al.* 2009), but can occur in higher salinities (Bennelongia 2016; Reeves *et al.* 2007; Watts and Humphreys 2006).

Troglofauna

Western Australia appears to be almost unique for its diverse and widespread troglofauna inhabiting small spaces in the vadose zone (Halse and Pearson 2014). The Western Australian troglofauna comprises mostly arthropods, with a variety of isopods, insects, spiders, pseudoscorpions, and millipedes, centipedes, and their allies represented. Troglofauna are particularly likely to occur in weathered or mineralised iron formations, alluvium or colluvium in valley-fill areas (including areas of karstic calcrete), and fractured sandstone (Halse 2018a). Troglofauna typically require relative humidity close to 100% (Howarth 1983).

1.2.1. Conservation legislation

Native flora and fauna in Western Australia are protected at both State and Commonwealth levels. At the state level, the *Biodiversity Conservation Act 2016* (BC Act) provides a legal framework for protection of species, particularly for species listed by the Minister for the Environment as threatened. In addition to the formal list of threatened species under the BC Act, the Department of Biodiversity, Conservation and Attractions (DBCA) also maintains a list of priority fauna species that are of conservation importance but, for various reasons, do not meet the criteria for listing as threatened. At the national level, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna and ecological communities.

Both the EPBC and BC Acts provide frameworks for the protection of threatened ecological communities (TECs), where an ecological community is defined as a naturally occurring group of plants, animals, and other organisms interacting in unique habitat (with the unique habitat created by the combination of the species and their landscape setting; DEC 2013). Communities occupying a small or threatened habitat are classified as threatened ecological communities (TECs) under the BC Act and the EPBC Act. Within Western Australia, DBCA also informally recognises communities of potential conservation concern, but for which there is little information, as priority ecological communities (PECs). The list of TECs recognised under the BC Act is larger than the EPBC Act list and has much greater focus on subterranean communities.

2. METHODS

The desktop assessment combined three sources of information using GIS mapping:

- Boundary information and description of Project activity was supplied by Bennett Energy.
- Records of subterranean animal occurrence in the vicinity of the project were obtained from the Western Australia Museum and Bennelongia databases, as well as relevant environment reports from other mines in the region and scientific literature.
- Boundaries of the subterranean fauna TECs and PECs were provided by DBCA and the Department of Mines, Industry Regulation, and Safety.
- Geological mapping to provide information about occurrence of likely subterranean fauna habitat.

Database searches covered two degree area centred on the Project (Figure 1). Analysis and mapping were undertaken using ArcGIS Pro v2.9.

3. SEARCH RESULTS

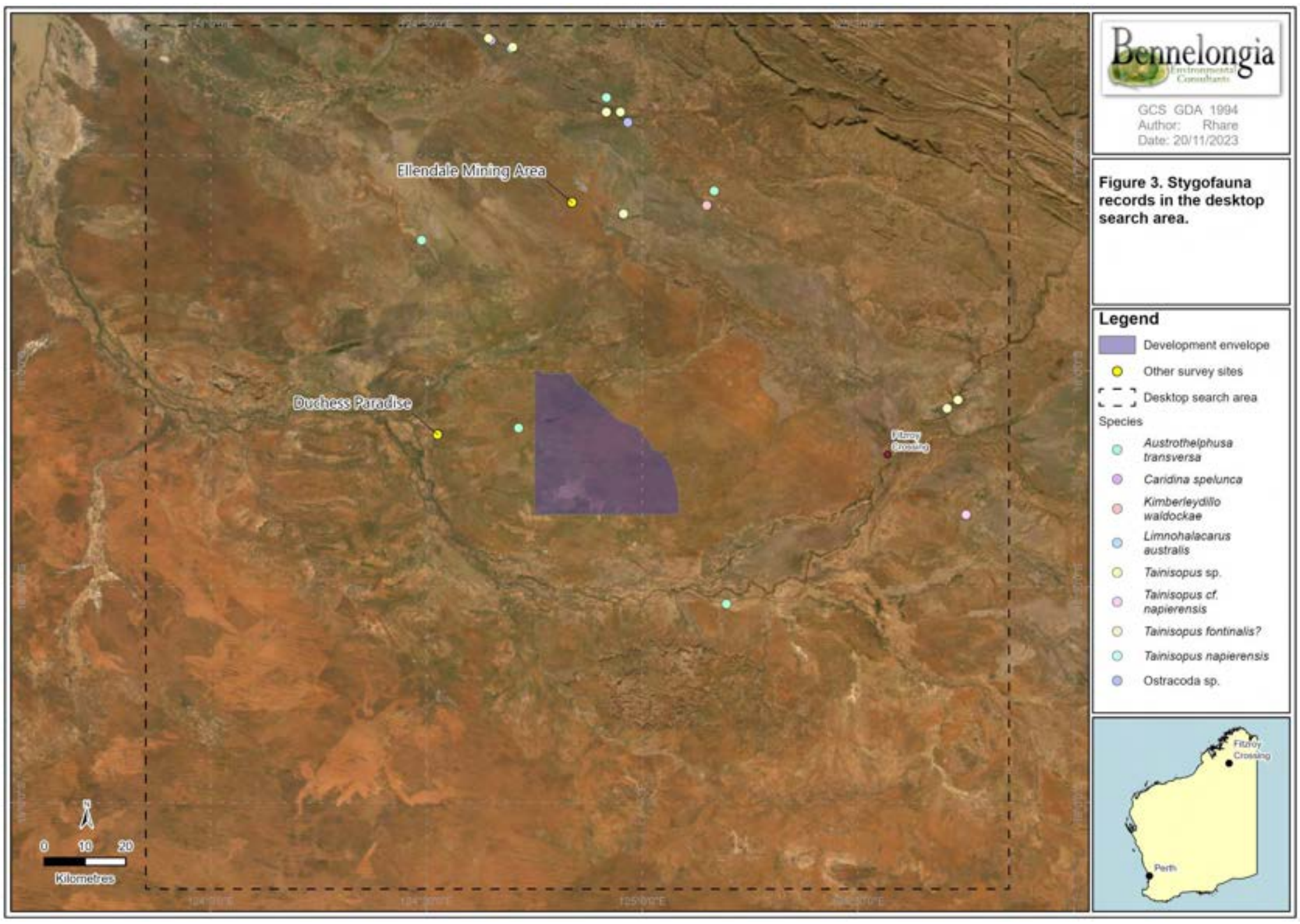
There has been little sampling of subterranean fauna in the desktop search area. No TECs or PECs are listed in the vicinity of the Project. However, up to 21 species of stygofauna have been collected in the desktop search area (Table 1, Figure 3).

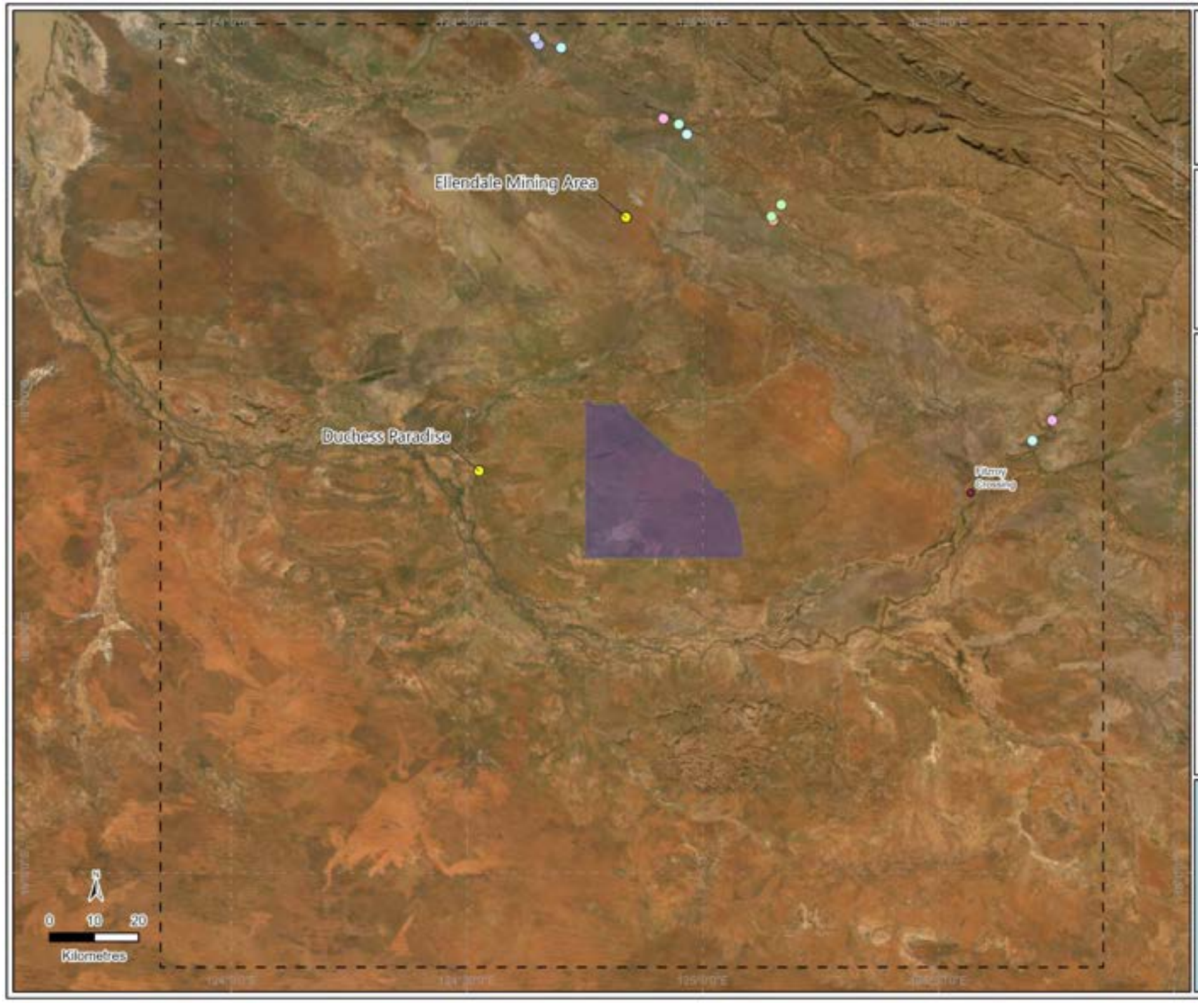
Table1. Subterranean fauna surveys in desktop search area and results.

Group	Species	Comments
Stygofauna		
Ellendale Diamond Mine, MBS Environmental/Brenton Knott 2010		
Acarina	Unidentified species	Possible stygofauna
Ostracoda	*Strandesia kimberleyensis*	Identified by Halse from photos in MBS report
	?*Candonopsis kimberleyi*	
Copepoda	Cyclopidae sp. 1	
	Cyclopidae sp. 2	
	3 unknown species	Inferred from Rockwater 2016
Isopoda	*Tainisopus* sp.	
MBS Environmental 2011, Duchess Paradise Project		
Nematoda	Unidentified species	Not assessed (EPA 2016)
Oligochaeta	Enchytraeidae sp.	Unknown habit and range
Copepoda	*Mesocyclops notius*	Widespread
Ostracoda	?*Reticypris* sp.	Uncertain identification (Halse)
Western Australian Museum database		
Acarina	*Limnohalacarus australis*	Collected from sink hole
Ostracoda	Unidentified species	
Decapoda	*Austrothelphusa transversa*	Caves, also surface occurrence
	Caridina spelunca	Caves
Isopoda	*Tainisopus napierensis*	Caves
	Tainisopus ?*fontinalis*	Caves
	Kimberleydillo waldockae	Cave
Troglofauna		
Western Australian Museum database		
Araneomorphae	*Heteropoda cavernicola*	No habitat information
Araneae	*Wandella infernalis*	Cave
Schizomida	Apozomus eberhardi	Cave
	Bamazomus hunti	Cave
Pseudoscorpiones	Indohya napierensis	Vadose tube
	Cheiridium sp. nov.	Cave
Diplopoda	?*Stygochiropus* sp.	Cave

According to Rockwater (2016), nine stygofauna species have been collected from boreholes and a cave at the Ellendale Diamond Mine about 45 km north of the Project but one of the species (an ostracod) appears to be a surface species, based on photographs in MBS (2010), and another (a mite) cannot be identified with enough resolution to determine whether it is stygofaunal. Four species of stygofauna have been collected from about 30 west of the Project at the Duchess Paradise Project in geology similar to that of the Project. According to Museum records, a further seven species have been collected from caves and a sink hole in limestone ranges north and west of the Project (Table 1, Figure 2).

Museum records also show that at least seven species of troglofauna have been collected from caves north and west of the Project (Table 1, Figure 4). This includes two species belonging to the iconic troglofaunal group Schizomida. Rockwater (2016) points out that both schizomid species have eyespots and may be troglophiles rather than troglobites (the former are found in the twilight zone of caves; the latter in dark zones) but the key issue is that use subterranean habitats. Higher level records and records


Ellendale Mining Area
Duchess Paradise
Fitzroy Crossing
0 10 20
Kilometres
Bennelongia
Environmental Consultants
GCS GDA 1994
Author: Rhare
Date: 20/11/2023
Figure 3. Stygofauna records in the desktop search area.
Legend
Development envelope
Other survey sites
Desktop search area
Species
Austrothelphusa transversa
Caridina spelunca
Kimberleydillo waldockae
Limnohalacarus australis
Tainisopus sp.
Tainisopus cf. napierensis
Tainisopus fontinalis?
Tainisopus napierensis
Ostracoda sp.
Fitzroy Crossing
Perth



Bennelongia Environmental Consultants

GCS GDA 1994
Author: Rhare
Date: 20/11/2023

Figure 4. Troglofauna records in the desktop search area.

Legend

- Development envelope
- Other survey sites
- Desktop search area
- *Apozomus eberhardi*
- *Bamazomus hunti*
- *Cheiridium* 'sp. nov.'
- *Heteropoda cavernicola*
- *Indohya napierensis*
- *Wandella infernalis*
- 'SCHAAC' 'SCH093'
- 'Stygiochiropus?' sp.

without specific habitat information have not been included in Table 1 but it is likely that several other species recorded in the desktop search area, especially pseudoscorpions, represent troglofauna.

4. DISCUSSION

The lack of much subterranean fauna sampling of sampling in the Kimberley makes it difficult to assess the likely richness of subterranean fauna communities in the surficial aquifers of the Fitzroy Trough. Saccò *et al.* (2022) provide a summary of stygofauna richness patterns in the Kimberley that supports the picture, based on results of the desktop search, that stygofauna probably occur. While the depth to water table in the Project area suggests the community there will not be rich, more evidence from sampling is required to understand whether stygofauna occur at the Project and the nature of the community. Richness may be greater than current data suggest. Surficial aquifers in alluvium and in sediments below sand plain are potentially prospective for stygofauna (Halse 2018).

While the likelihood of stygofauna occurrence and the nature of any stygofauna community remains unclear, this has little relevance to an assessment of potential impacts of groundwater abstraction on stygofauna in the Project area because the maximum drawdown experienced at each bore is modelled to be only 1.2 m and to decline to 1 m at 56 m from the bore. The level of drawdown interpreted as having potential impact on stygoofauna is usually taken to be 2 m (EPA 2016). Both the very small spatial extent of drawdown, and the minimal drawdown itself at the Project, indicate the there is little likelihood of impact on stygofauna, irrespective of whether a stygofauna community is present.

As with stygofauna, the potential impact of the Project on troglofauna can be assessed by examining the potential impacts without reference to whether troglofauna occurs. The small modelled drawdown will have no impact on troglofauna. Ground disturbance will be limited to the drawdown associated with drilling and preparations for surface construction. These activities will have very little likelihood of impact on troglofauna, irrespective of whether a troglofauna community is present.

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Appendix T. Canning Basin Technical Discussion

BLACKMOUNTAIN
ENERGY

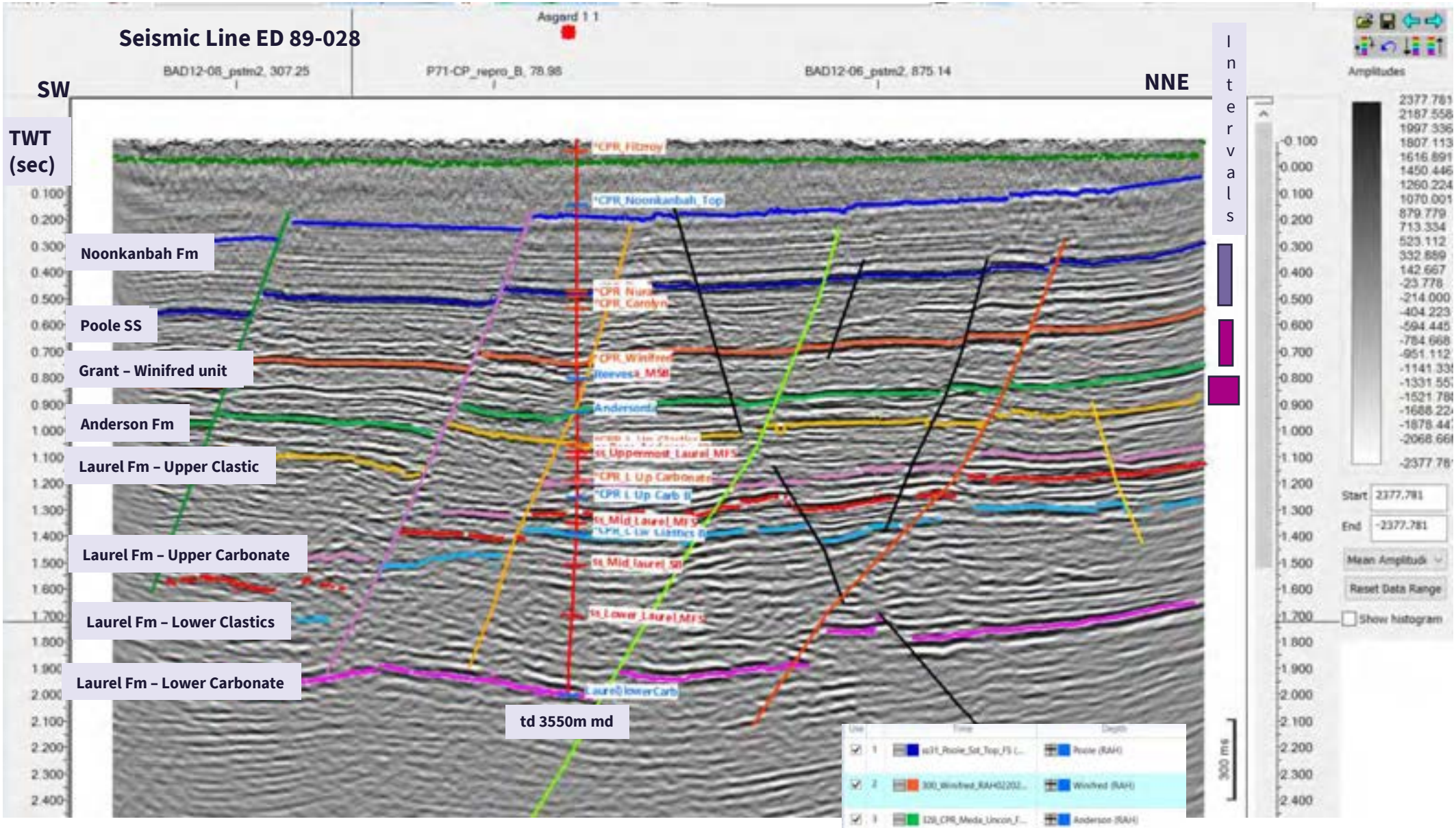
CANNING BASIN – TECHNICAL DISCUSSION EPA ESD

November 1, 2023

Strictly Private and Confidential

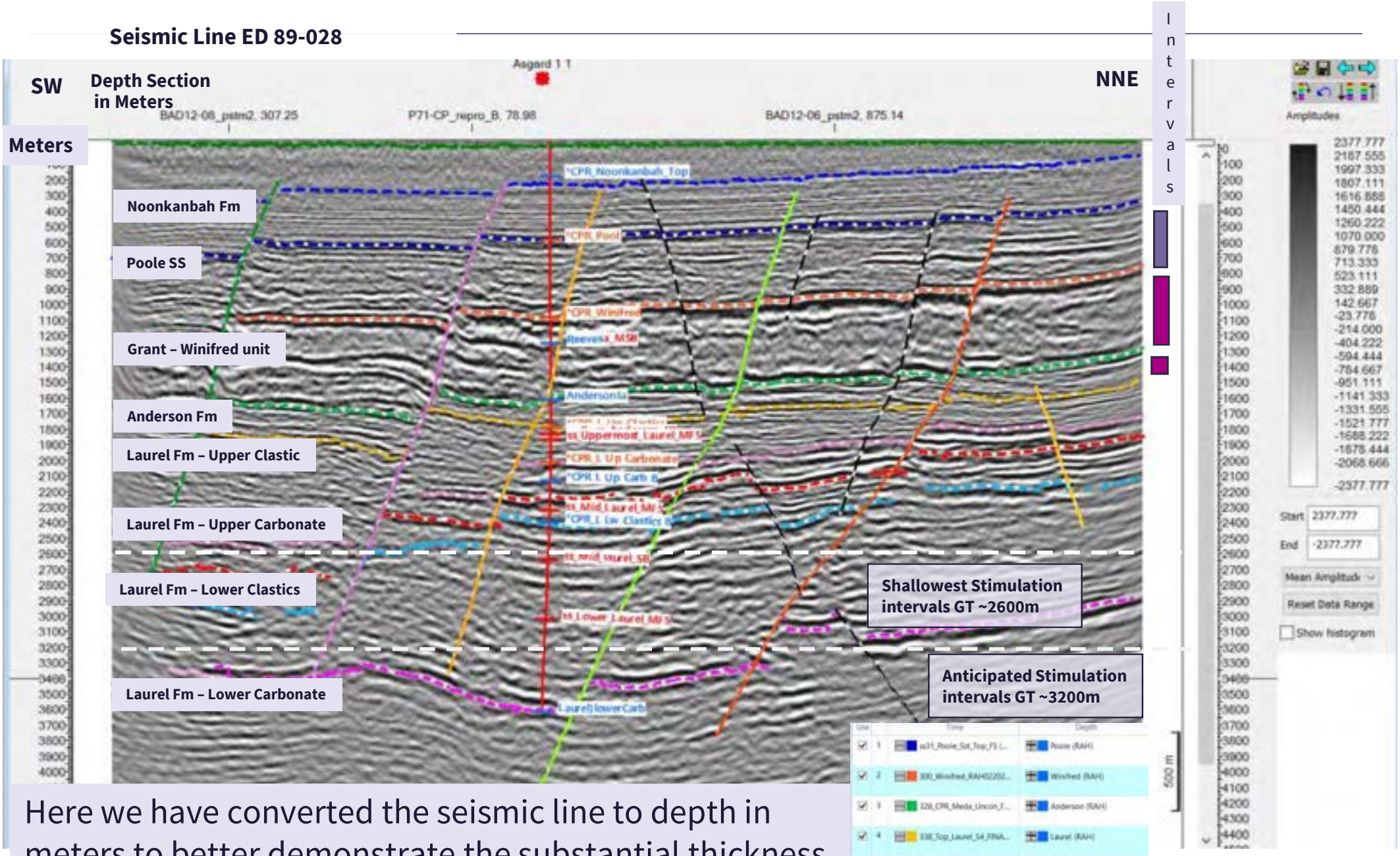
INTRODUCTION

Figure 1a, 2D Seismic time section showing key geological intervals for Anderson, Grant/Winfred and Poole Formations



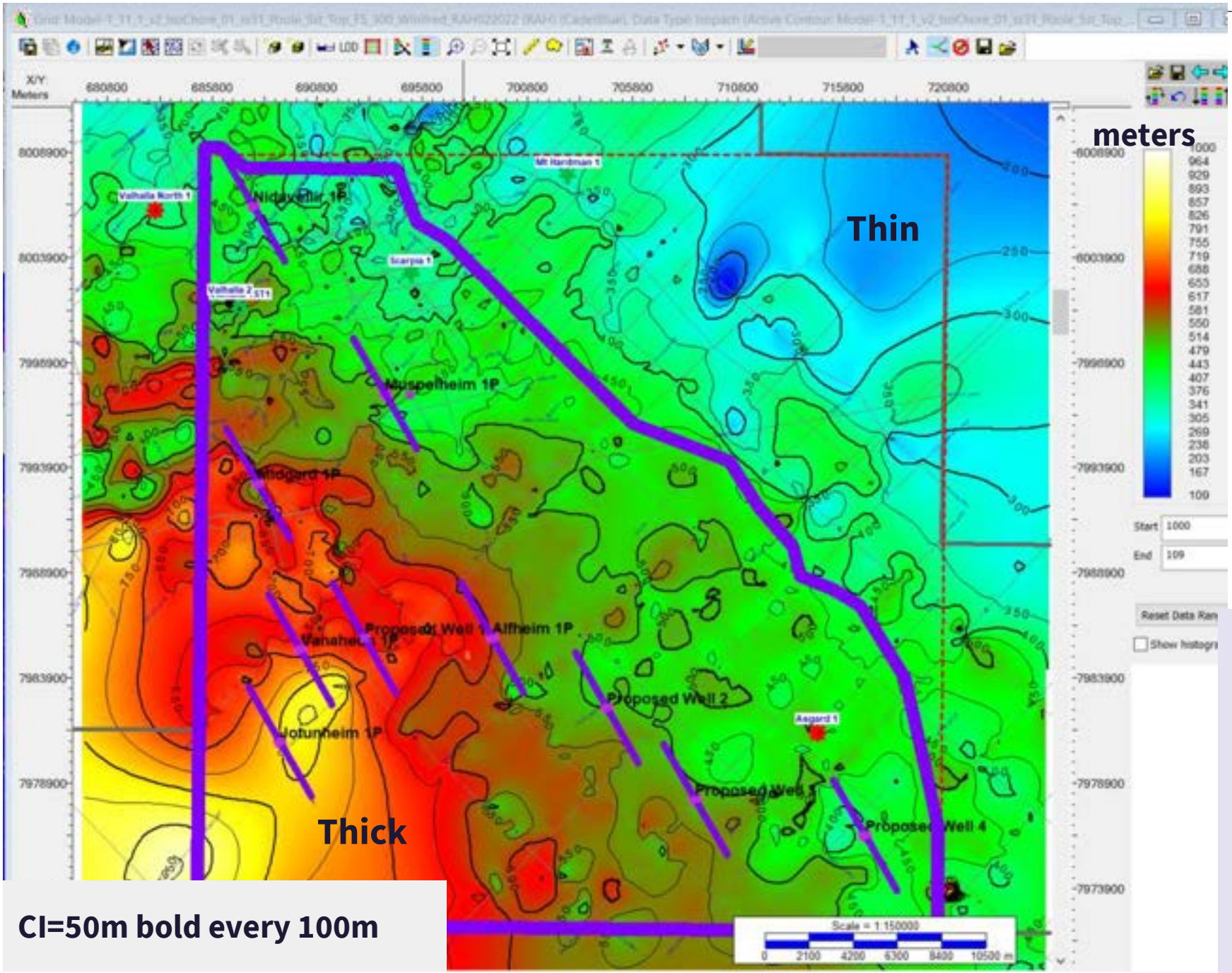
Geological Survey of Western Australia rpt 207 notes the difficulty of discerning the Anderson pick from Reeves in this area. Further stratigraphic study or additional well data is needed to understand the local unconformities and their timing.

Figure 1b, 2D seismic depth section showing key intervals of Anderson, Grant/Winfred and Poole Formations



Here we have converted the seismic line to depth in meters to better demonstrate the substantial thickness of the overlying sediment above any proposed HFS.

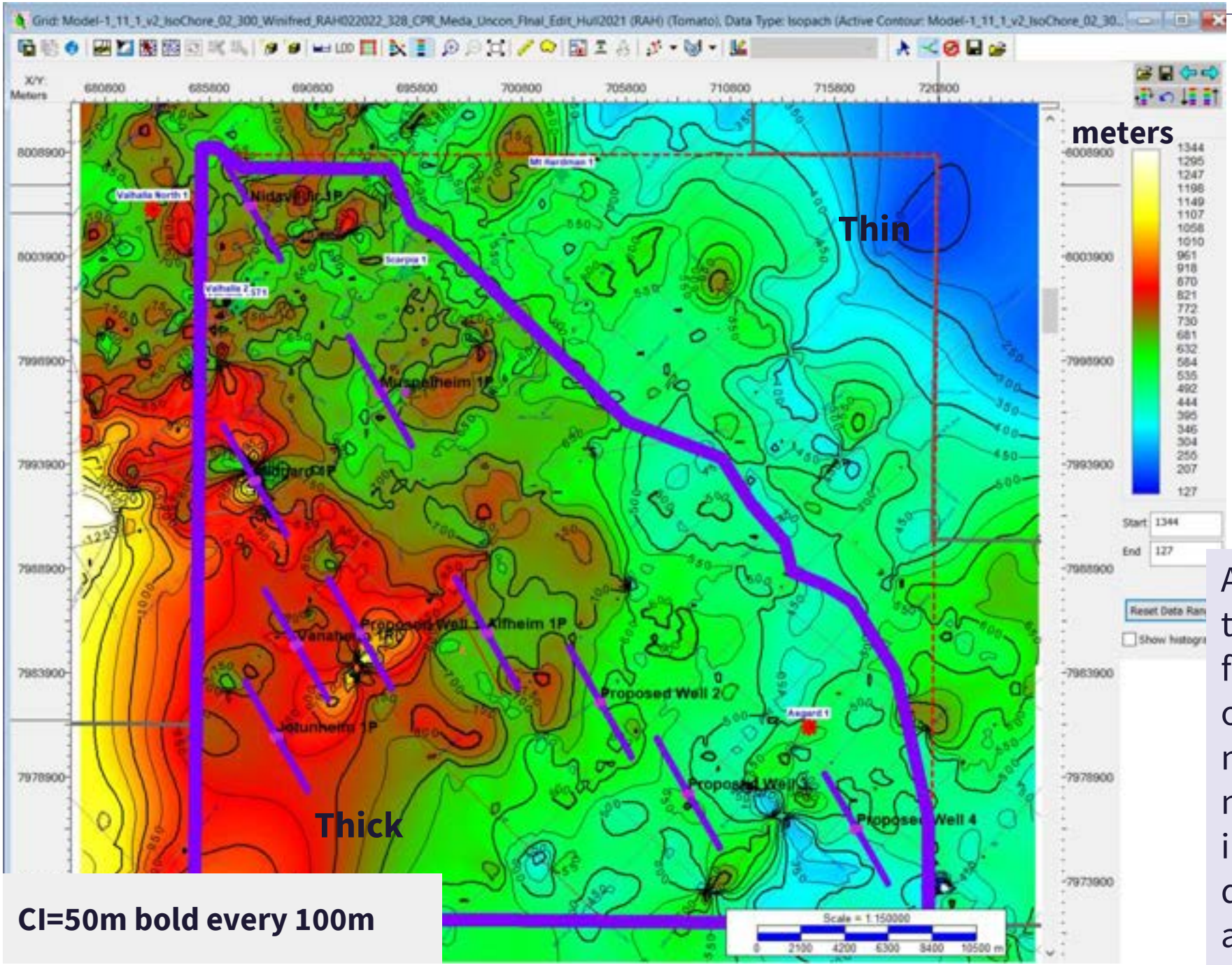
Figure 1c Poole to Grant/Winifred Isochore (Aquifer)



CI=50m bold every 100m

A substantial thick section from 400 m to over 900m is noted for this interval in the development area.

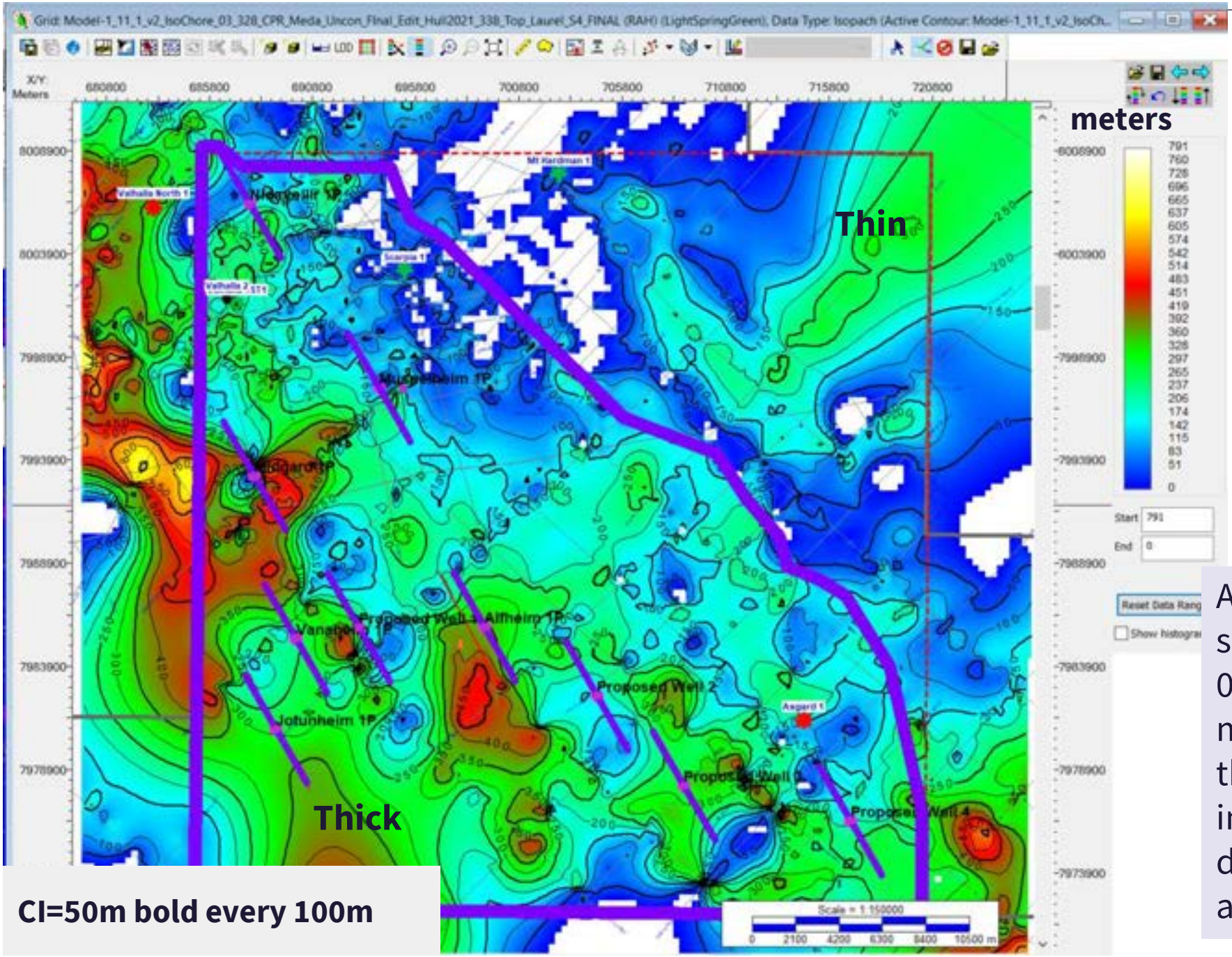
Figure 1d Winifred To Anderson Isochore (Non-Aquifer)



CI=50m bold every 100m

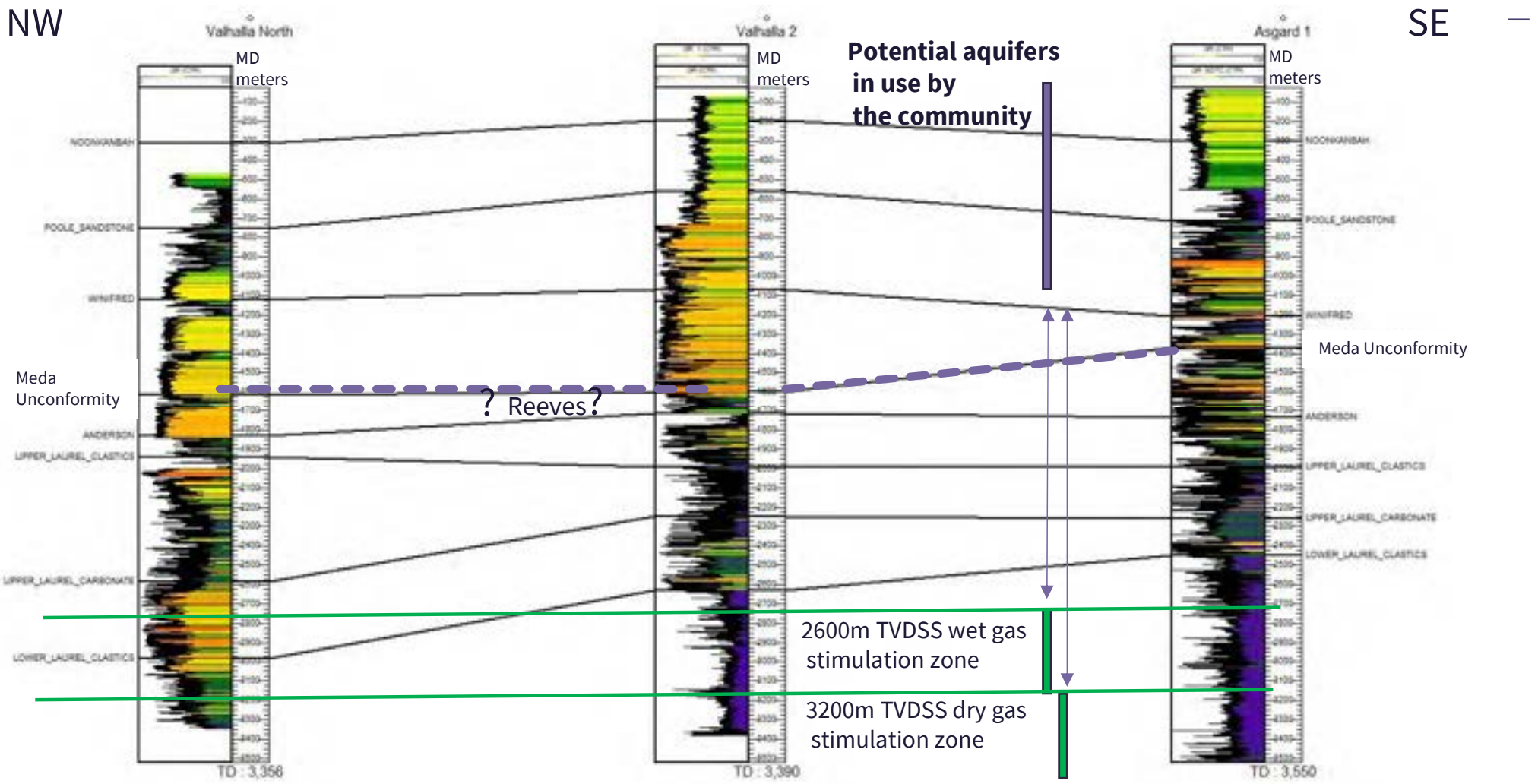
A substantial thick section from 500m to over 900m is noted for this non aquifer interval in the development area.

Figure 1e Anderson to Laurel Isochore (Non-Aquifer)



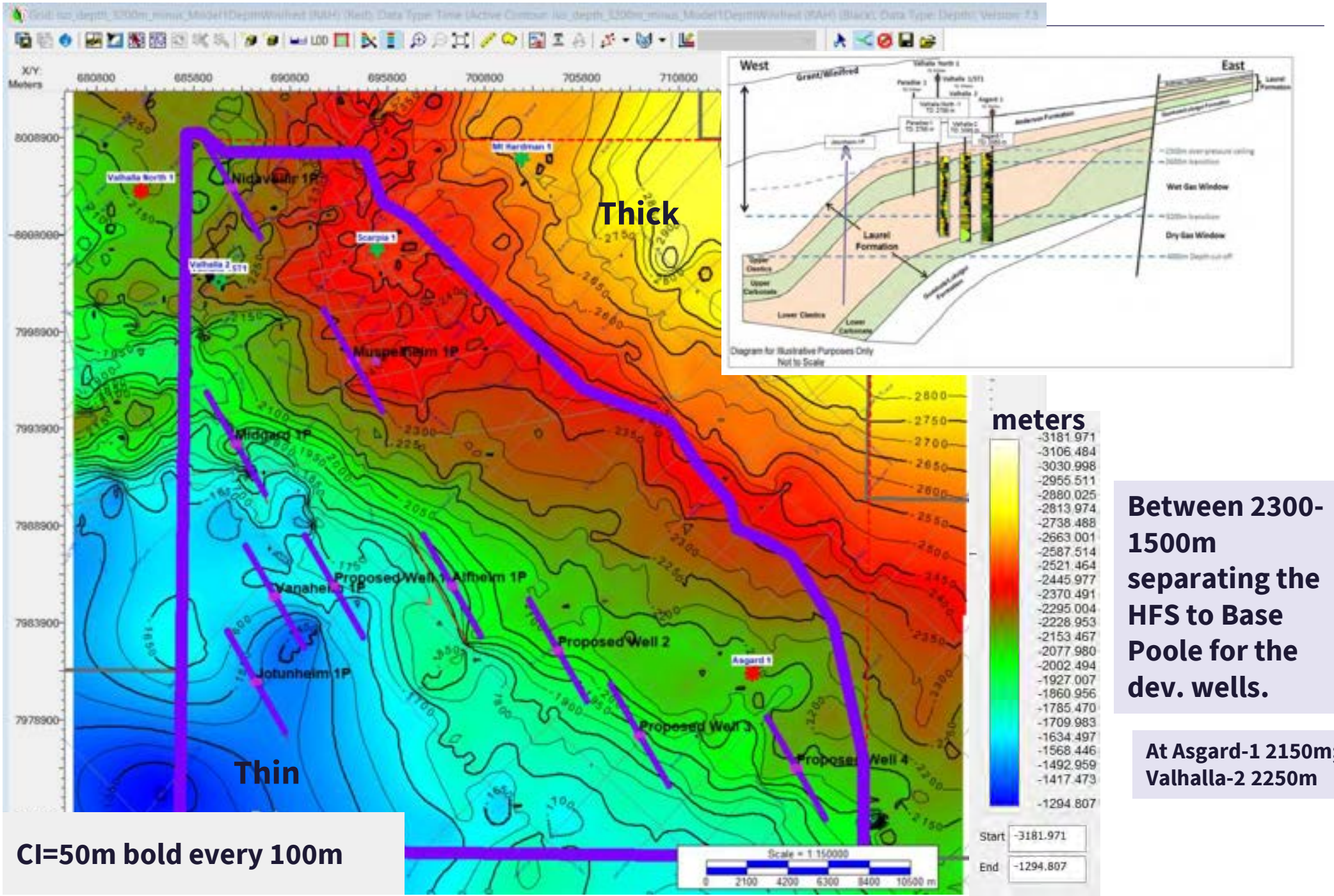
A thinner section from 0m to over 450 m is noted for this non aquifer interval in the development area.

Figure 2 Regional Cross Section illustrating regional lithostratigraphy



Shallowest stimulation depths in excess of 1,550 m from aquifers in use at Asgard -1.
Deeper dry gas in excess of 2,150m from aquifer at Asgard-1.

Figure 3a map showing the lateral variability of offset between the shallowest HFS interval that is likely (3200m) and the base of the deepest aquifer (Poole)/ Top Grant Winifred

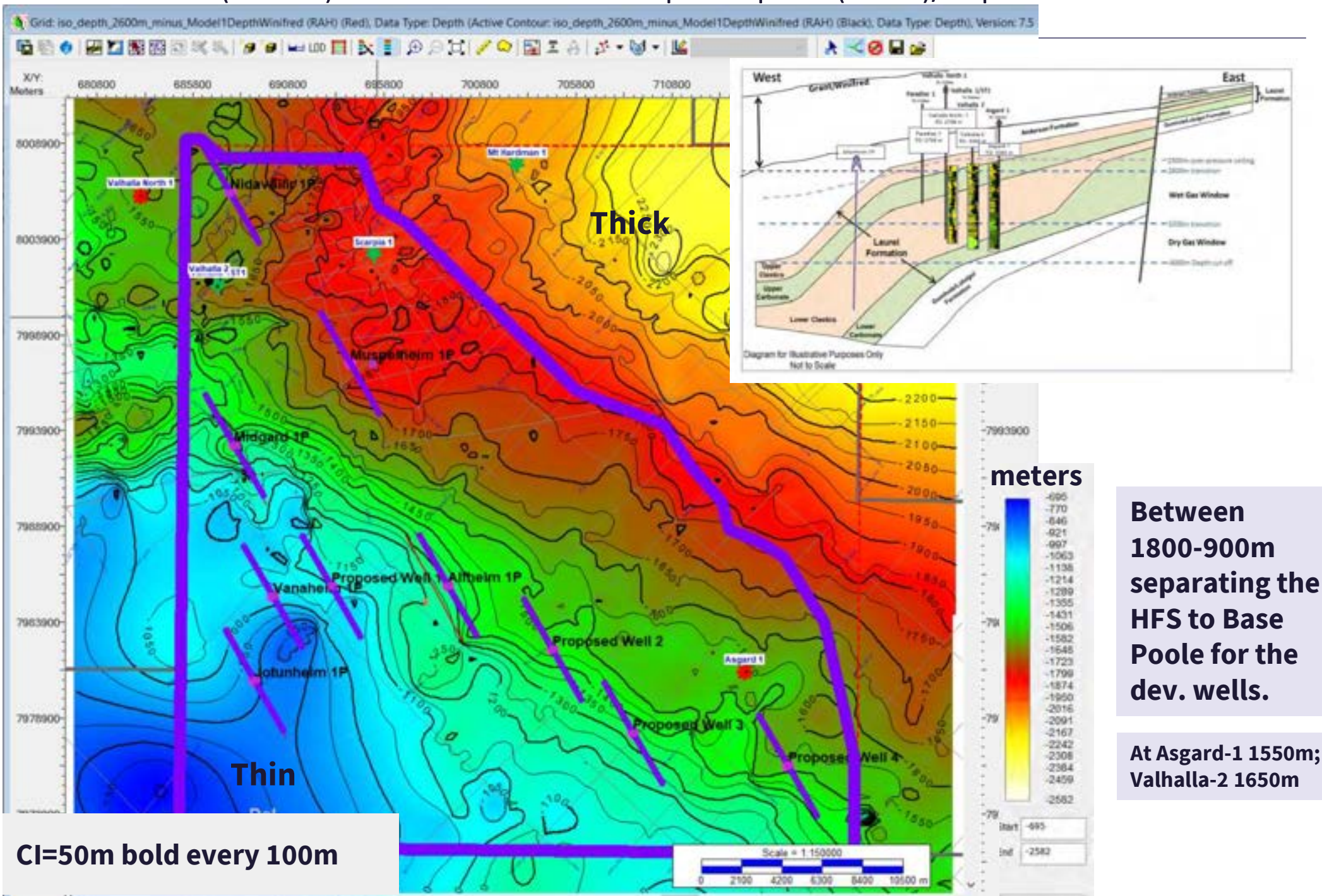


Between 2300-1500m separating the HFS to Base Poole for the dev. wells.

At Asgard-1 2150m; Valhalla-2 2250m

CI=50m bold every 100m

Figure 3b map showing the lateral variability of offset between the shallowest potential HFS interval (2600m) and the base of the deepest aquifer (Poole)/ top Grant Winifred



CI=50m bold every 100m

Between 1800-900m separating the HFS to Base Poole for the dev. wells.

At Asgard-1 1550m; Valhalla-2 1650m

LAUREL STRATIGRAPHIC BENCH MODEL

- Prograding Laurel marine siliciclastics and carbonates were deposited in a transitional ramp setting.
- Key updip vertical have tested producible quantities of thermogenic gas.
- A future well is envisioned targeting downdip upper Laurel reservoirs that are optimal in reservoir quality as well in a dry gas window of higher pressure.

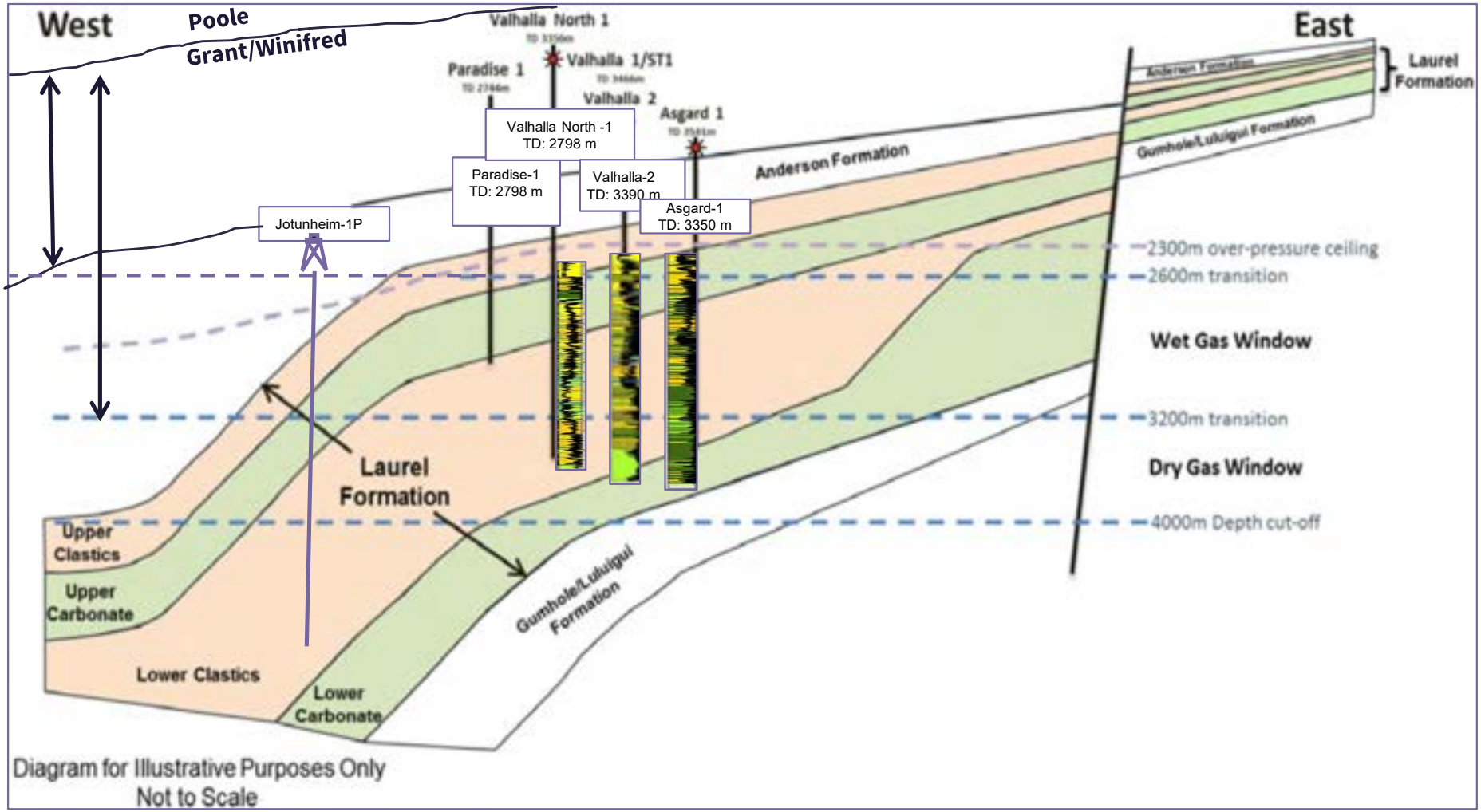
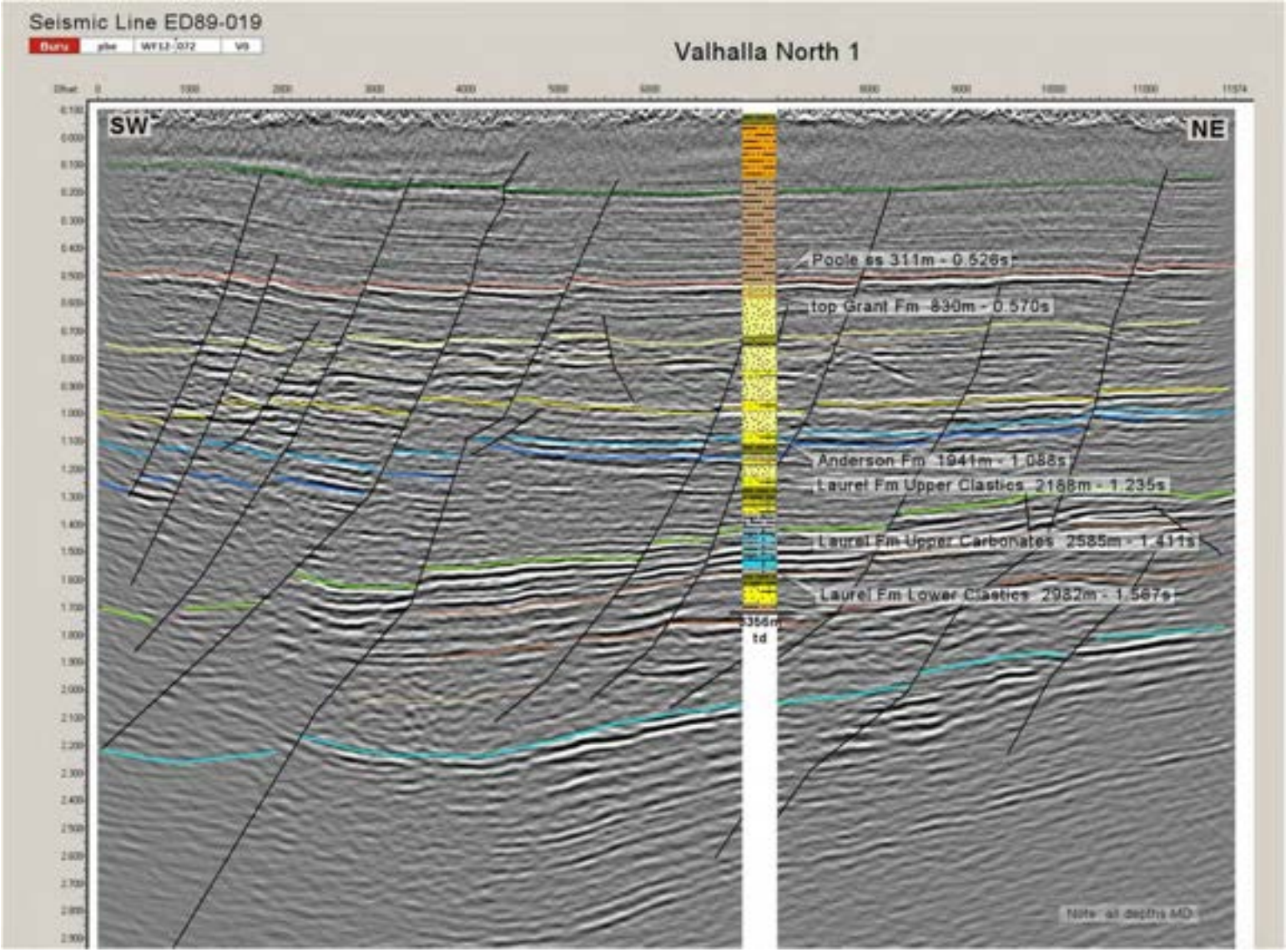


Figure 4

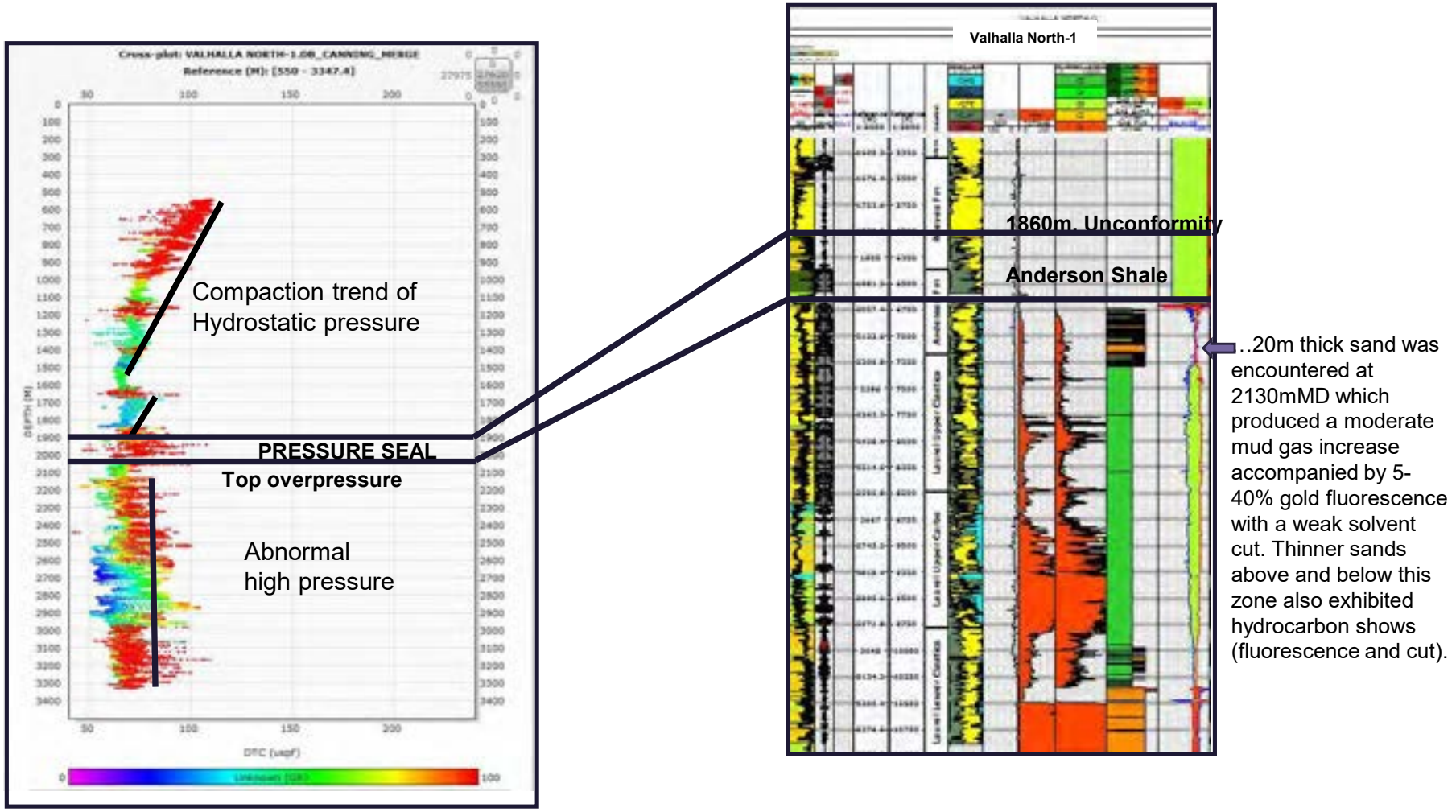
Faults here typically place older units up dip against younger units downdip.

We do not anticipate given the current data any significant juxtaposition against younger (Poole) units updip



Seismic section ED89-019 with Valhalla North 1.

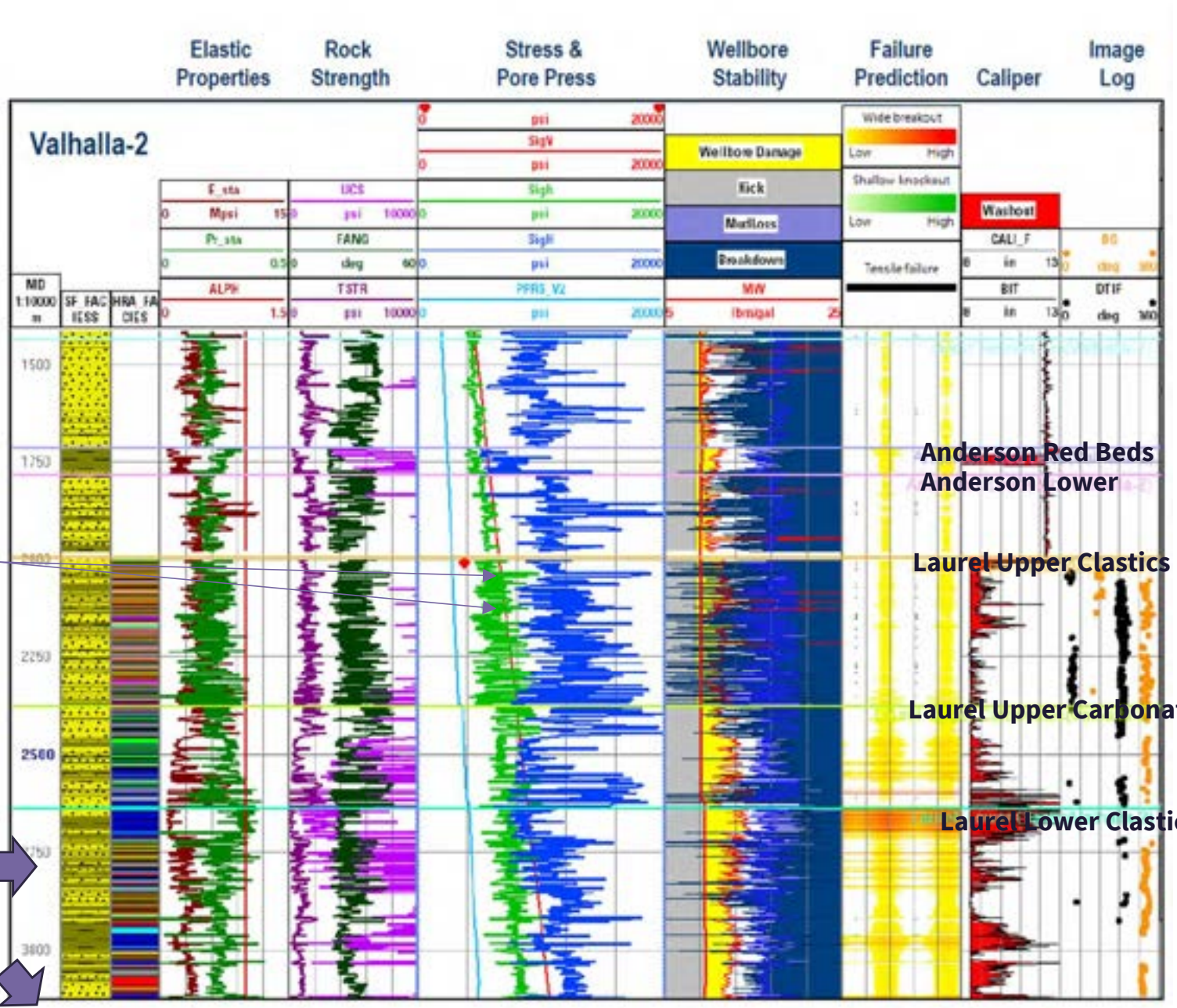
Figure 5 Pressure Seal



Fracturing, Faulting, and Stress

Figure 6: Valhalla 2 Sonic Log

Formations with higher rock strength (UCS) and higher relative stress are found above hydrocarbon targets of interest



High Rock Strength ~ 10,000 PSI

Higher Anticipated Poroelastic Stress

High Rock Strength > 10,000 PSI

A stimulation at 2600m SS (2725 MD)

A stimulation at 3200m SS (3325 MD)

Anderson Red Beds
Anderson Lower

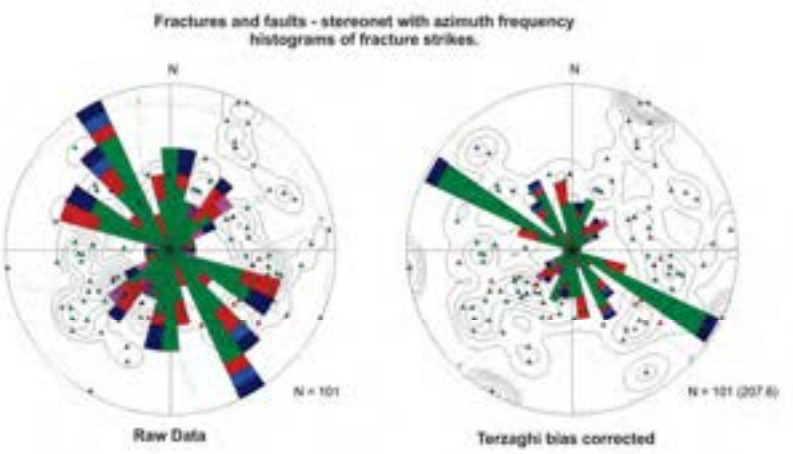
Laurel Upper Clastics

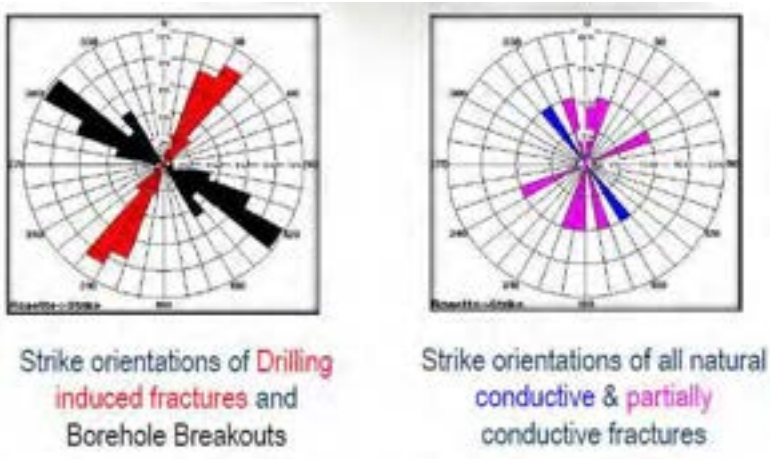
Laurel Upper Carbonates

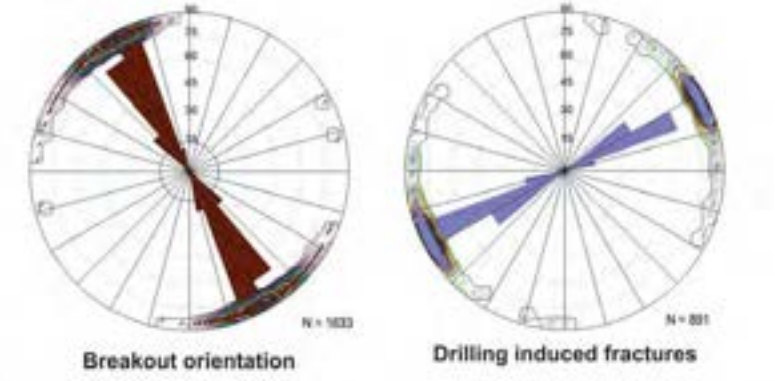
Laurel Lower Clastics

Figure 7: Fracturing/Faulting vs. Stress Direction

- Intense and frequent fracturing and faulting situated 60-90 degrees from SH,max
  - Implications:
    - Ideal orientation to create fracture enhanced system permeability feed-in through crossing fractures
    - Difficulty opening the fractures in tension (mode I), restricting or eliminating the ability to dilate and prop







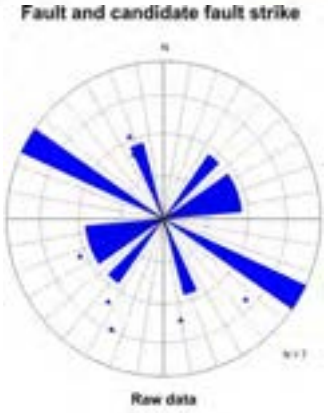
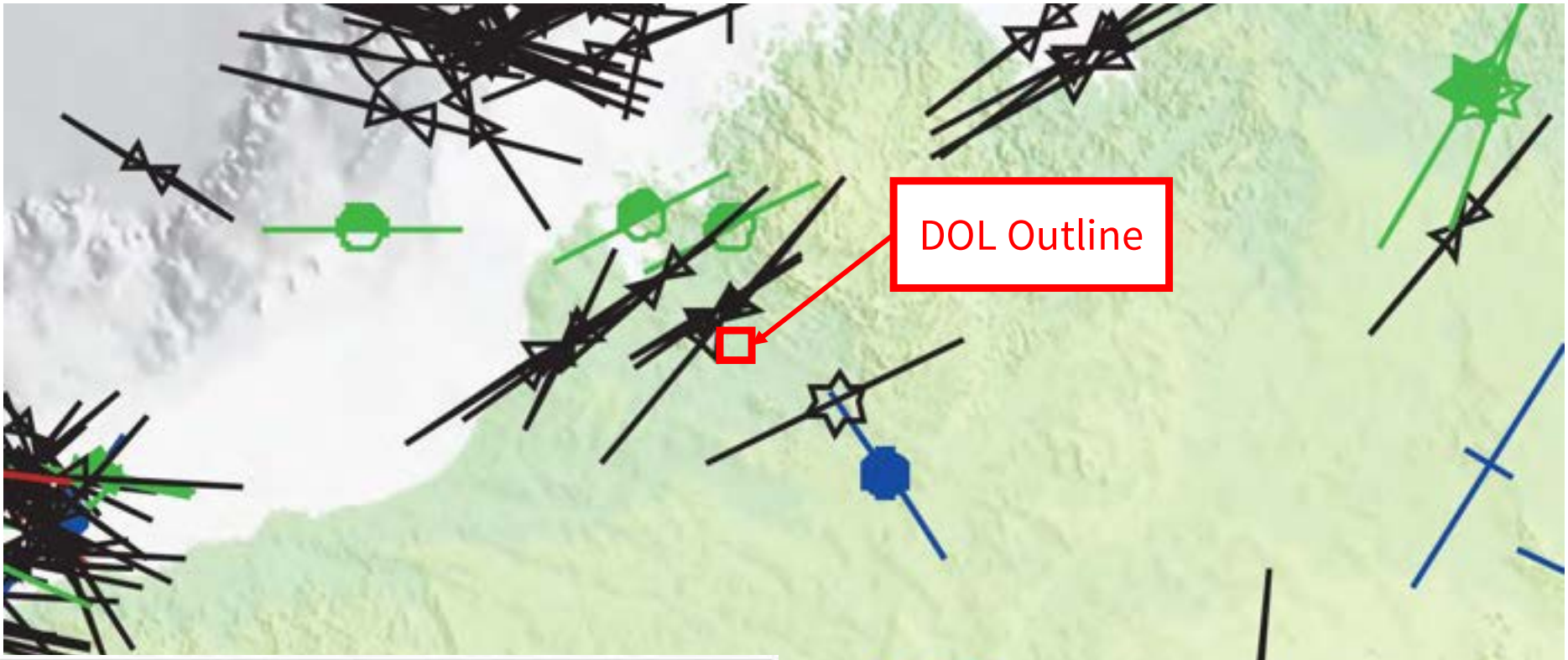


Figure 8: World Stress Map, 2016 Revision



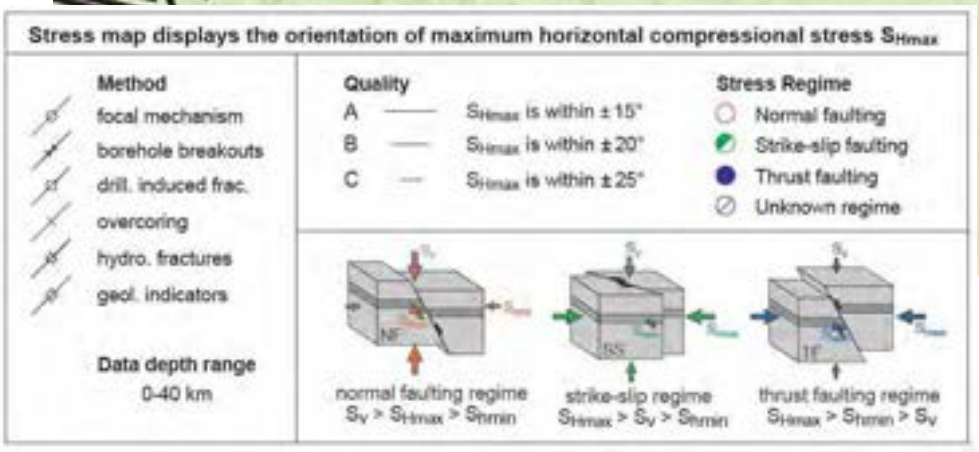


Figure 9: Microseismic Review from Valhalla North 1

- Significant vertical growth, but heights are within range of uncertainties
  - Bulk of microseisms range from 200-300 meters per zone
  - Uncertainty +/- 360 meters

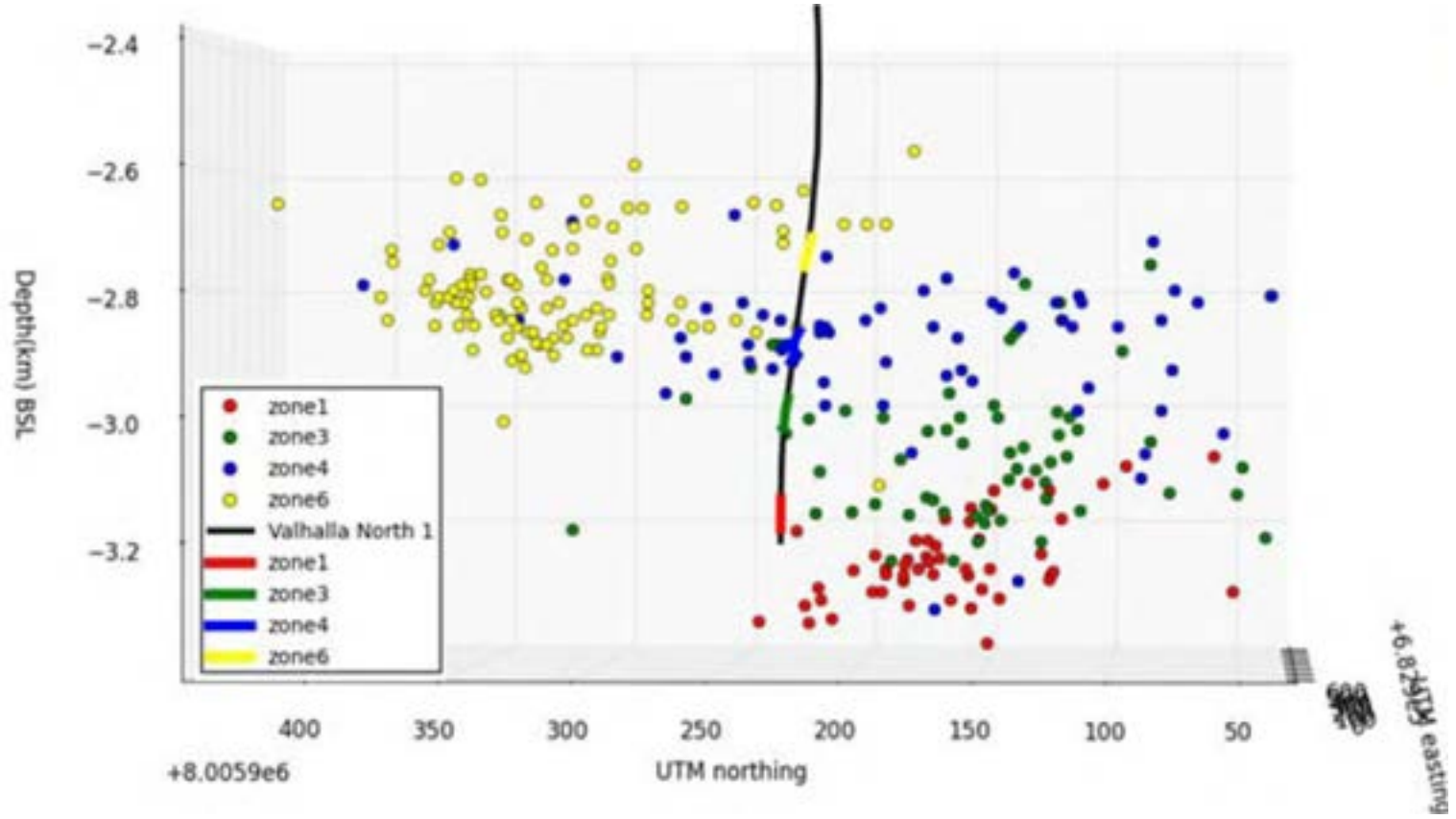


Figure 10: Warpinski 2011: True Vertical Depth in (ft) vs. Aquifer Depth

- 1,000's of feet separate all recorded microseisms and aquifer depths