APPENDIX H

Preliminary Acid Sulfate Soil Investigation

SMEC
Member of the Surbana Jurong Group

local people
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Preliminary Acid Sulfate Soil Investigation

Six Mile Creek Dam Upgrade

Reference No. 30031970 A4.13.2
Prepared for Seqwater

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1 Introduction

1.1 Background

SMEC Australia Pty Ltd (SMEC) was commissioned by Seqwater to undertake a preliminary geotechnical site investigation and characterise any inland Acid Sulfate Soils (ASS) identified with the Initial Advice Statement (IAS) for the proposed Six Mile Creek Dam safety upgrade project.

Six Mile Creek Dam (the site), also known as Lake Macdonald, is on the Sunshine Coast in the Noosa Shire and is one of two principal raw water sources that supply potable drinking water to the residents of Noosa Shire. The safety upgrade works will include building a new spillway and reconstructing the existing earth embankments to better protect the dam against earthquakes and extreme floods events. It is understood that the project will include:

- The temporary lowering of Lake Macdonald to a level of 89.0 m AHD during the construction period (18 to 24 months) including the further lowering to a level of 88.5 m AHD for approximately two months.
- The installation of sheet piling approximately 300 m in length and up to 10 m depth, and secant piles 135 m in length and 18 m depth and associated dewatering.

The site location is shown in Figure 1-1.

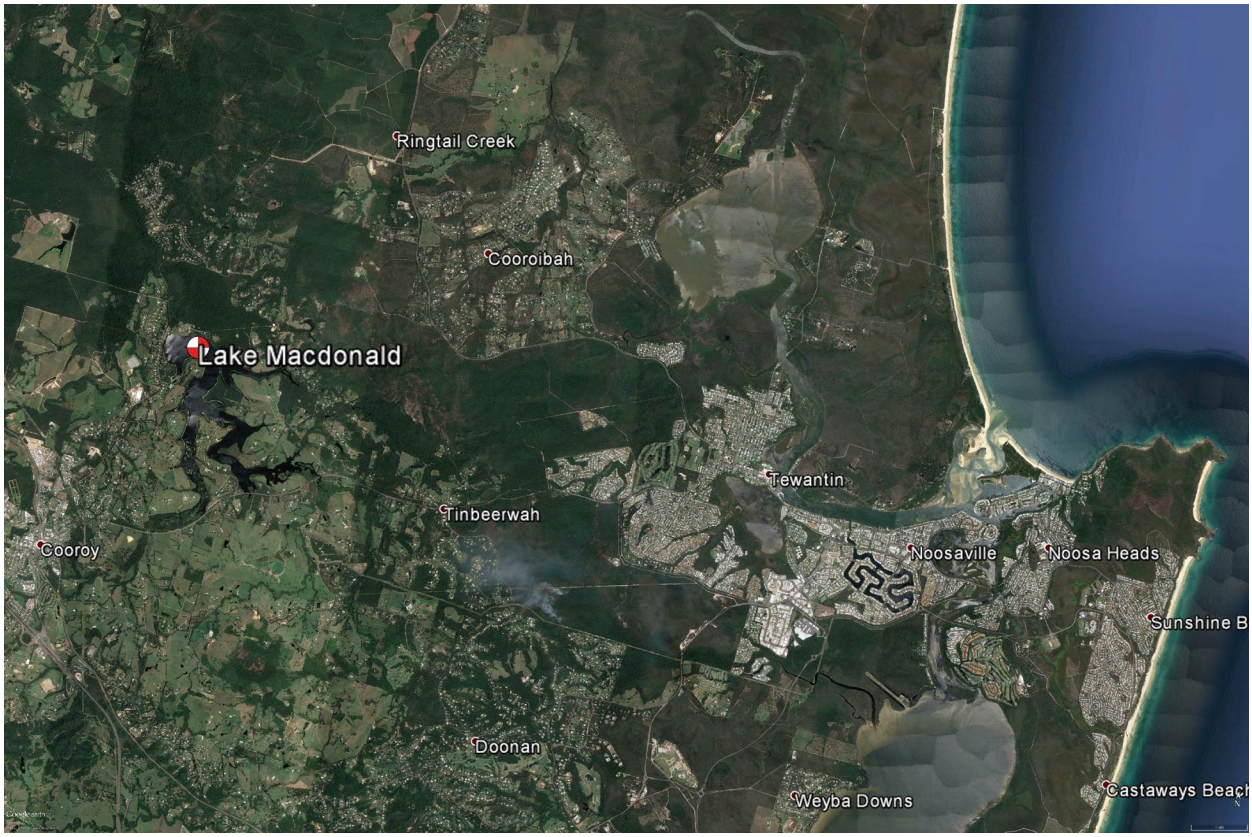

Figure 1-1: Locality Map

1.2 Purpose

The purpose of this report is to:

- Review existing information, geotechnical site investigation observations and available site data to document the ASS characteristics on the site
- Assist with informing future decisions relevant to managing risk with the natural and built environment.

1.3 Report Scope

The following was undertaken to meet the purpose of the report:

- Review of available background data

- Preparation of a Health, Safety and Environment (HSE) Plan, Sampling Analysis Plan (SAP) and preliminary Conceptual Site Model (CSM)
- Completion of a site inspection and investigation including service location, subsurface drilling and sampling
- Review of laboratory analytical data
- Development of recommendations.

Where this report is to be used by Seqwater for future tendering purposes, reference should be made to the details relating to geotechnical reports and their limitations in section 7. The ASS assessments and recommendations contained within this report are based on information available at the time of writing. Should any observation or modifications be made to the current property, the information contained within may become inaccurate or void.

1.4 Legislation, Standards and Guidelines

This report has been prepared with reference to the relevant sections of the following:

- *Environmental Protection Act 1994*
- Queensland State Planning Policy 2017
- Queensland State Planning Policy – State Interest Guideline Water Quality 2014
- Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines (2014)
- Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland (1998)
- AS4969-2008 Analysis of Acid Sulfate Soil
- AS1726-2017 Geotechnical Site Investigations
- AS/NZS 5667.11:1998 (R2016) Water Quality Sampling. Part 11: Guidance on Sampling of Groundwaters
- National guidance for the Management of Acid Sulfate Soils in Inland Aquatic Ecosystems (2011)
- National Acid Sulfate Soils Guidance - Dewatering of Acid Sulfate Soils (2018)
- National Acid Sulfate Soils Guidance – Water Quality Australia (2018).

2 Site Characteristics

2.1 Site Identification

The investigation site is identified by the following features listed in Table 2-1.

Table 2-1: Site identification

FEATURE	DESCRIPTION
Tenure	Freehold
Address	Lake Macdonald, Queensland 4563
Real Property Description	Lot 118 MCH814, Lot 1 RP800331 and also within the road reserves of Lake Macdonald Drive and Collwood Road
Local Government	Noosa Shire Council

2.2 Site Description and Topographical Setting

The investigation site forms part of the larger lacustrine wetland area and spillway to Six Mile Creek that currently supports several environmental related activities. Lake Macdonald is an ungated earth and rockfill dam with overtopping flows passively passing the spillway structure to Six Mile Creek once full supply is exceeded. Access is by Lake Macdonald Drive or Collwood Road (sealed pavement) to the access road that services the Noosa Water Treatment Plant (WTP).

Vegetation communities that include remnant vegetation are present at the site, and Tewantin National Park is approximately 250 m north of the investigation site. Lake Macdonald supports habitat values for native fish, waterbirds, frogs, and reptiles. Species of conservation significance are known to occur in the lake.

The dam was constructed in the early 1960s and was raised in 1979 to create the current storage. Ownership was transferred from Noosa Council to Seqwater on 1 July 2008. The site is approximately between 80 m and 100 m Australian Height Datum (AHD) with Mount Tinbeerwah (265 m AHD) approximately 4.5 km east of the site.

A site investigation plan is provided in Appendix A .

2.3 Regional Geology

According to the 1:100,000 geological map (Geological Map Series Sheet 9445 - Gympie) prepared by the Queensland Government, the site geology comprises Quaternary aged flood plain alluvial sediments (Qa) including clay, silt, sand and gravel. Geology recorded north and east of the site is inferred to include Late Triassic to Early Jurassic aged Myrtle Creek Sandstone (RJdm) that comprise quartzose sandstone, orthoquartzite, sublabile to labile sandstone, siltstone and shale. Kin Kin beds recorded in broader southern and western sections of the site is inferred to comprise minor volcanilithic sandstone with strongly cleaved and commonly kinked mudstone with thin siltstone laminae.

No fractures, folds, lineaments, trends or other geological features are recorded within the investigation area. A fault (approximate) is recorded approximately 1.3 km from the investigation site, trending in a north-west to south-east direction. Geological fractures (Lineaments) are recorded approximately 1.3 km south-west from the site.

A regional geology map extract is presented in Figure 2-1. Table 2-2 summarises the description of the materials typically found within the mapped units.

Atlas of Australian Soils (Queensland) mapping indicate the Project area is within rolling to low hilly terrain of a weakly dissected sedimentary basin with gently sloping convex hills with some significant stream flats (type Mb9). Soil types is inferred to comprise gradational mottled yellow, A2 horizon conspicuously bleached, acid massive earth mottled B horizon.

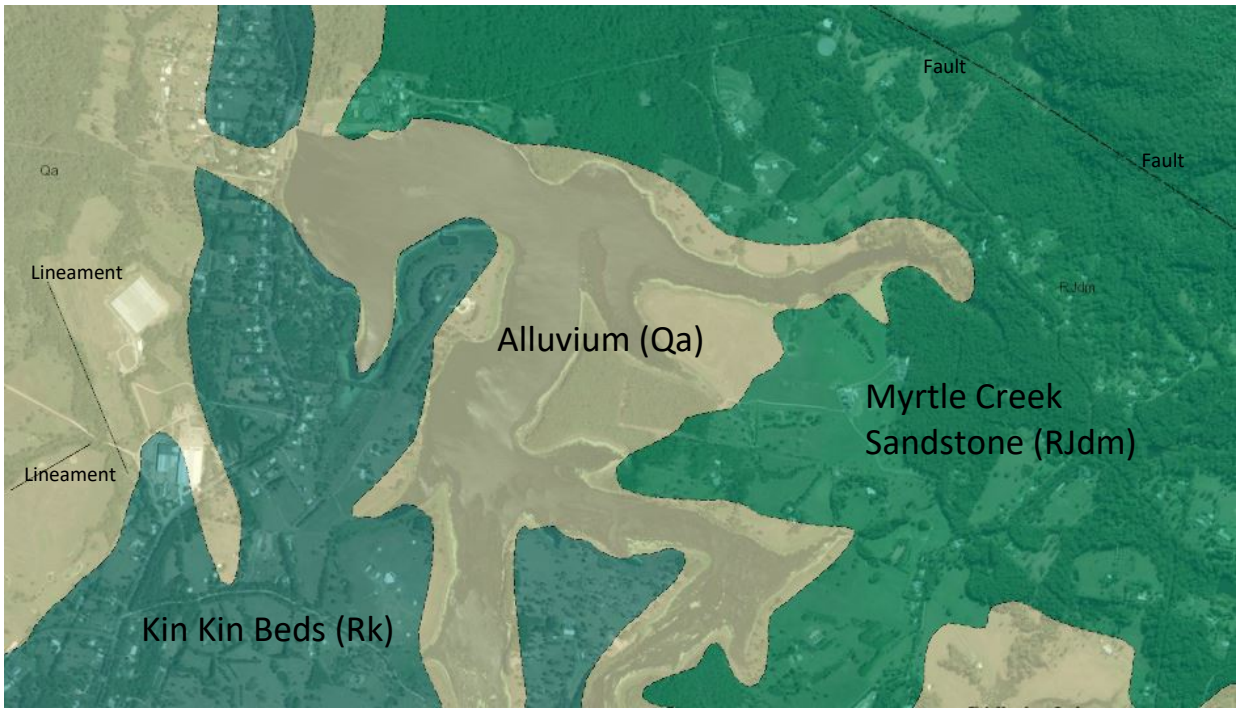

Figure 2-1: Regional geological map

Table 2-2: Regional geological mapping unit summary

SYMBOL	COLOUR	UNIT	AGE	LITHOGRAPHIC DECSCRIPTION
Qa		Qa-QLD	Quaternary	Flood-plain alluvium: clay, silt, sand and gravel.
Rk		Kin Kin Beds (748)	Middle Triassic	Minor volcanilithic sandstone strongly cleaved and commonly kinked mudstone with thin siltstone laminae.
RJdm		Myrtle Creek Sandstone (1039)	Late Triassic – Early Jurassic	Quartzose sandstone, orthoquartzite, sublabile to labile sandstone, siltstone and shale.
Fault		9445 - Gympie	N/A	Fault (Approximate)
Fracture		9445 - Gympie	N/A	Lineament

2.4 Regional Acid Sulfate Soils

Unlike coastal ASS that can generally be confined to spatial datum (below 5 m AHD) and geological age (Holocene), inland ASS can be found within different stratigraphy and aged deposits. Soil composition or hydro-morphic qualities, organic matter, microbial activity and geochemistry are some of the influencing factors of inland ASS. These materials generally containing iron monosulfides and iron sulfides predominately in the form of pyritic material that is a product of the natural interaction between metal ions, organic matter, sulfate and sulfate reducing bacteria present in anaerobic wetland environments (Fitzpatrick & Shand 2008). ASS can be present in an anaerobic state within the subsurface profile and exposed as the result of natural or anthropogenic disturbance, changes in groundwater levels and/or exposure to oxygen. Disturbances of ASS and associated acidity can mobilise metals and metalloids that occur naturally within the soil. This acidity and leachate has the potential to have a significant impact on surface water quality, groundwater systems, terrestrial environments and built infrastructure.

Review of CSIRO Australian Soil Resource Information System (ASRIS) mapping resources indicates there is a high probability of ASS occurrence at Lake Macdonald. Inland ASS mapping and risk categorises are inferred from national

soil classification coverages combined with 1:250K hydrography and multiresolution valley bottom floor indexes. An extract of the national ASS mapping is shown in Figure 2-2.

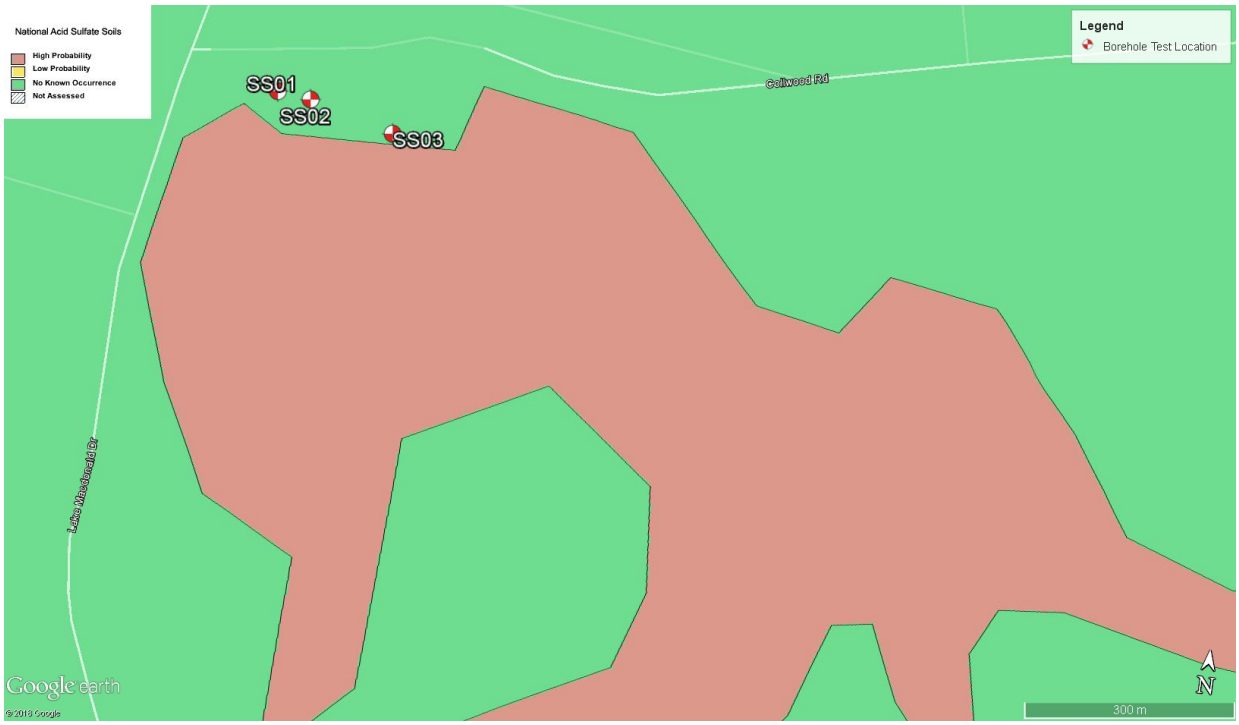

Figure 2-2: ASRIS map

2.5 Regional Hydrology

The investigation site is within the Upper Mary River Sub Basin, which comprises the Mary River, Kandanga Creek, Yabba Creek, Obi Obi Creek along with their tributaries, including Six Mile Creek. The investigation focuses on upgrade works to Six Mile Creek Dam (Lake Macdonald) which flows into Six Mile Creek. Six Mile Creek discharges into the Upper Mary River, which is approximately 55 km downstream of Lake Macdonald. The total catchment area of Six Mile Creek is 263 km^2, the upper 50 km^2 of which is occupied by the Lake Macdonald catchment. The Upper Mary River catchment is 2,713 km^2, inclusive of the Six Mile Creek catchment.

Rainfall data from Bureau of Meteorology (BOM) weather station Eumundi (040078), located approximately 10.7 km from the site, recorded 9.4 mm of rainfall in August 2018, with an annual rainfall to August 2018 of 1115.4 mm. Rain periods occurred during site investigations with 5.4 mm rainfall recorded on 5 September 2018.

Groundwater levels and conditions in the area are considered to fluctuate seasonally due to the proximity to Lake Macdonald and both upstream and downstream tributaries may also be influenced by significant rainfall events. Groundwater conditions on the site are likely to vary with both location and time. Factors impacting on the physical groundwater environment include:

- Seasonal changes: groundwater levels are generally highest during and just following the wet season, and lowest in the dry season.
- Significant rainfall events: increased recharge during heavy or prolonged rainfall events can result in elevated groundwater levels
- Geological structure: differences in the geological conditions can lead to significant variation in groundwater conditions both vertically and laterally.

A search of registered groundwater bores was undertaken using the Department of Natural Resources, Mines and Energy database accessed through Queensland Globe. There are six registered groundwater bores within a 1 km radius of the geotechnical site test locations. It is noted that groundwater analysis and collections of samples was not from any of these registered water bores. A summary of the registered water bore is provided in Table 2-3 and the bore report included as Appendix B .

Table 2-3: Registered groundwater bore summary

ID	LATITUDE/LONGITUDE	DRILLED DATE	FACILITY TYPE	STATUS
RN174777	-26.38311889/152.92854657	12/12/2017	Sub-Artesian Facility	Existing
RN164371	-26.38402457/152.9254315	26/02/2014	Sub-Artesian Facility	Existing
RN117318	-26.37729786/152.92800801	22/12/2003	Sub-Artesian Facility	Existing
RN150598	-26.3771068/152.9244144	06/10/2009	Sub-Artesian Facility	Existing
RN174121	-26.38902425/152.9277062	09/11/2016	Sub-Artesian Facility	Existing
RN174259	-26.39034331/152.92924932	02/03/2017	Sub-Artesian Facility	Existing

2.6 Site History and Background Data

2.6.1 Factual Geotechnical Investigation

Prior to the site investigation, the proponent provided a factual report of geotechnical investigations (Draft 500 Series Factual Geotechnical Report October 2017) and the Lake MacDonald Dam Revised Foundation Investigations and Optimisation Study (11 April 2018) undertaken by AECOM. At the time of reporting no information on ASS or pyritic acid sulfate rock (ASR) was available from previous geotechnical investigations associated with the investigation site. It is noted any results of durability design testing (AS2159 Piling Design and Installation) from previous geotechnical investigations that would generally include sulfate analysis was not available at the time of reporting. Sulfate levels above 1000 ppm may indicate the presence and/or previous microbial activity of sulfate reducing bacteria that are a contributing factor to the occurrence of inland ASS.

3 Geotechnical Site Investigation

3.1 Method of Investigation

The geotechnical site inspection and intrusive ground investigations boreholes were carried out on 5 September 2018 by SMEC. The position of the investigation boreholes was selected to deliver adequate information on representative site conditions and provide suitable land-based access to drilling rig and support vehicles. Consideration was given to avoiding disturbance to the existing underground services and the Noosa Water Treatment Plant operating conditions while aiming to mitigate potential environmental disturbance. All exploratory borehole locations were identified and recorded by SMEC surveyed using a hand-held GPS to an accuracy of approximately ±5.0 m.

3.2 Public Utility and Plant

A search of underground utilities was undertaken with Dial Before You Dig (DBYD) before mobilisation and resulted in notifications including:

- Energex
- Noosa Council
- SEQ Water
- Telstra
- Unity Water North.

Drawings provided by the proponent and a site walkover with a Seqwater representative indicated that some stormwater services were in proximity to some of the proposed borehole locations, which were subsequently relocated to ensure no conflict. Test locations were progressed with a hand auger to 1.5 m below the surface in accordance with Seqwater recommendations.

3.3 Borehole Investigations

The investigation boreholes were created using a track mounted Geoprobe (Model 7720DT) drilling rig (Figure 3-1) to collect representative and continuous soil cores throughout the profile. A total of three boreholes (SS01, SS02 and SS03) were drilled to depths between 4.2 m and 9.3 m below the existing surface level as part of a preliminary ASS investigation. Borehole locations were originally recorded as BH601, BH602 and BH603, but were relabelled to avoid conflict with the 600-series geotechnical investigation being undertaken concurrently by others. All boreholes were drilled and sampled using hand auger for the first 1.5 m below ground surface levels to minimise potential impact to utilities and then utilising direct push tube or tungsten carbide bit solid flight auger techniques. SMEC site inspections were programmed to provide preliminary information on ASS characteristics in the observed profiles.

SMEC supervised the fieldwork and logged the boreholes, noting changes in consistency, density, plasticity fines, moisture content, odours, and colour of the encountered strata. Test locations were rehabilitated with materials onsite to ensure disturbances were limited and area reinstated.

Explanatory notes with engineering logs are provided in Appendix C . Engineering logs of boreholes are presented in Appendix D . A summary of the test locations is detailed in Table 3-1.

Table 3-1: Site investigation location summary

LOCATION ID	SPATIAL POSITION (MGA94 ZONE 56S)		TERMINATION/REFUSAL DEPTH IN METRES (BGL)
	EASTING	NORTHING	
SS01	493067	7082109	9.3
SS02	493116	7082103	5.0
SS03	493242	7082038	4.2

Figure 3-1 - Drilling Rig at test location SSS01

3.4 Subsurface Profile Observations

The encountered sub surface conditions inferred from SMEC boreholes on the site were generally consistent with the site geology and can be divided into the four distinct profiles described below. No visible signs of ASS such as gley soils (waterlogged and blue-grey colour), monosulfidic black ooze (MBO) or straw coloured (2.5Y, Chroma ≥6) mottling (indicating iron sulfate minerals such as jarosite) were observed within the soil strata during the site investigation. No hydrogen sulfide odour or vegetation phytotoxic stress were recorded within the immediate investigation site that can be considered a potential field indicator of ASS.

3.4.1 Topsoil Materials

Topsoil material at the surface generally comprised silty sand that was brown in colour to depths of between 0.0 m and 0.15 m at test locations. The materials provided limited resistance during hand auguring with a trace of organics recorded as fine roots less than 5 mm in diameter in the profile.

3.4.2 Fill Materials

Fill materials generally comprised fine to coarse grained clayey sand and high plasticity clay in test locations SS01 and SS02 to a depth of 2.3 m and 2.7 m respectively. The material was generally pale to dark brown with some orange and red mottling. Fill material was observed in test location SS03 from 0.1 m to auger refusal at 4.2 m and generally comprised fine to coarse grained, medium to high plasticity clayey sand and sandy clay with a trace of fine to medium grained angular and sub angular gravel.

3.4.3 Alluvial Materials

Below the fill profile, alluvial soils consisting of an upper and lower sub profile were recorded. The upper alluvial sand deposit was pale brown in colour, generally comprising fine to coarse grained sand and high plasticity sandy clay.

Lower alluvial soils comprised the inclusion of fine to medium grained sub-angular to sub-rounded gravel transitioning to sandy gravel in test location SS01. Alluvial materials were recorded during site investigations from 2.2 m and 2.7 m in test locations SS01 and SS02 respectively.

3.4.4 Residual Materials

Below the alluvial profile, residual soils generally consisting of sandy clay and clayey sand were recorded commencing from 7.4 m below existing ground levels in test location SS01. This material was observed to the limit of investigation at 9.3 m and inferred as extremely weathered rock material from 9.1 m.

3.5 Groundwater

Groundwater inflow was encountered in all boreholes with a standing depth of 1.6 m, 1.6 m and 2.0 m below existing ground surface level in test locations SS01, SS02 and SS03 respectively.

3.6 Laboratory Analysis Sampling

Representative soil samples were collected by SMEC during site investigations. Samples were collected at 0.25 m depth intervals at all test locations. A minimum of 200 g was collected for each sample, with samples labelled and wrapped in a 200 µm plastic bag to expel air and immediately sealed.

Groundwater grab samples were collected at test locations DH4 and BH203 directly from previously installed piezometers to gain an initial understanding of ASS indicators. It is not known if the previously installed piezometers were installed in accordance with Minimum Construction Requirements for Water Bores in Australia (2012). Triple wash decontamination procedures were used between each groundwater test location. Approximately three borehole volumes of recharged groundwater were purged using a submersible pump. Samples were transferred into appropriate laboratory-prepared containers suitable for the respective analysis and correctly preserved, with zero headspace and included the use of field filtration (0.45 µm). In-situ groundwater parameters, comprising pH, electrical conductivity, temperature, redox and dissolved oxygen, were also measured in the field using a calibrated water quality meter once stabilised. A summary of the groundwater test locations is detailed in Table 3-2.

All samples were collected with new disposable sampling and protective equipment. Following collection, samples were immediately placed into chests with ice and dispatched under Chain of Custody to the NATA accredited laboratory identified in Table 3-3. All laboratory test certificates and quality control results are provided in Appendix E.

Table 3-2: Groundwater sample location summary

LOCATION ID	SPATIAL POSITION (MGA94 ZONE 56S)		STANDING WATER LEVEL (TOC) (m)
	EASTING	NORTHING	
DH4	493033	7082117	1.68
BH203	493227	7082096	2.92

Table 3-3: Laboratory scope

LABORATORY	LOCATION	TEST DESCRIPTION	QUANTITY
Eurofins MGT Pty Ltd	Murarrie QLD 4172	Field screen	74
		Chromium reducible sulfur suite	19
		ASS Groundwater suite	2

4 Adopted Assessment Criteria

4.1.1 Field Screen Analysis

Field screen testing with pH field (pH_F) and pH field oxidised (pH_{FOX}) was conducted as a preliminary and qualitative screening analysis on all representative samples using the peroxide oxidation method set out in AS4969. Field screening test results are assessed by these pre and post oxidation pH levels to indicate the presence of Actual ASS (AASS) and Potential ASS (PASS). The interpretations generally placed on these qualitative indicator pH levels and reactions include:

- pH field (pH_F)
  - <4 – Inferred as oxidised acid sulfate soil
  - <4.5 – Inferred as extremely acidic soil, possibly due to pyrite oxidation or can be due to the soil being highly organic or from prolonged fertiliser use
  - 4.5-5.5 – Inferred as highly acidic soil, however it is not conclusive that low pH is due to pyrite oxidation
  - >6 – No actual acidity
- pH oxidised (pH_{FOX})
  - <3 – Strongly inferred as PASS
  - 3-4 – Inferred PASS, lab analysis would be required to confirm presence of sulfides
  - 4-5 – Inferred level of sulfides present, or the sample might be poorly reactive or fine carbonates are present
  - >5 – With a minimal difference to pH_F, this is unlikely to be PASS unless carbonates are present in the sample.

Field screen analysis also included a reaction rating observation of between 1 to 4 to classify the level samples reacted to the peroxide that includes:

1. No reaction to slight
2. Moderate reaction
3. Strong reaction with persistent froth
4. Extreme reaction.

Field screen analysis is a preliminary test method with limitations that provides qualitative indicators to undertake further analysis using the chromium reducible sulfur suite.

4.1.2 Chromium Reducible Sulfur Analysis

Quantitative laboratory analyses by Chromium Reducible Sulfur (S_{CR}) suite in accordance with AS4969 were undertaken on selected samples to assess the level and nature of acidity or potential acidity present in the soil profile. The quantum of actual acidity was assessed using Titratable Actual Acidity (TAA) and if pH_{KCL} was less than 4.5 testing for retained acidity (S_{NAS}) was included. The nature of the actual acidity (Sulfuric or Non-Sulfuric) was assessed by consideration of potassium chloride extractable sulfur (S_{KCL}), chromium reducible sulfur (S_{CR}) and net acid soluble sulfur (S_{NAS}). The potential acidity was analysed by the S_{CR} method to measure reduced inorganic oxidisable sulfur. Acid neutralising capacity (ANC) was analysed including a fineness fraction (FF) of 1.5 and can determine the buffering capacity to neutralise any acid generating potential of the material.

In summary the quantum of net acidity is determined by acid-based accounting (ABA) using the following calculation:

Net Acidity = Actual Acidity(TAA) + Retained Acidity(S_{NAS}) + Potential Acidity(S_{CR})- Acid Neutralising Capacity(ANC/FF)

5 Laboratory Results and Analysis

5.1 Acid Sulfate Soils Analysis

Field screen results in the alluvial profile indicate that pH field levels range between 5.2 to 6.6 with field oxidised pH level ranging between 3.1 to 5.8. Reaction ratings were between none and extreme, however organics that were observed during investigations and responsive materials such as calcium carbonate (recorded as ANC) can influence these results. Results indicate generally mildly acidic conditions in the representative materials tested, with additional laboratory testing (S_{CR} Suite) required to confirm and the nature and quantum of acidity.

An action criterion of 18 mol H+/tonne (0.03% S) with a sum of existing and potential acidity is recommended when applying texture-based ASS measures from Queensland Guidelines (2014) for excavation works and disturbances of material greater than 1,000 tonnes. Laboratory results indicate:

- A total of five of nineteen representative samples analysed had actual acidity values greater than 18 mol H+/t.
- Titratable actual acidity was recorded between <10 mol H+/t (limit of reporting) and 25 mol H+/t.
- All oxidisable inorganic sulfur (S_{CR}) was below the level of reporting (3 mol H+/t) in all samples demonstrating that no pyritic materials were above the action criteria indicating PASS.
- ANC was recorded in test location SS01 (3.5-3.75 m and 4.0-4.25 m) with 11 and 14 mol H+/t respectively verified with back titration.
- Net acidity ranged from <10 mol H+/t to 25 mol H+/t in all representative samples analysed.

The nature of the actual acidity based on no reportable oxidisable sulfur (S_{CR}), retained acidity (S_{NAS}) and soluble sulfur(S_{KCl}) infer levels of existing acidity is unclear and unlikely to be sulfuric in source. Laboratory results showed pH_{KCL} levels between 4.8 and 6.8, with 10 of 17 representative samples below the action criterion of pH_{KCL} 5.5 established in the Queensland ASS Guidelines (2014) that specify management options.

Where the source of acidity is unclear and pH_{KCL} levels are below 5.5, management options include treatment of acidic soil with a neutralisation agent. Based on a titratable actual acidity of 25 mol H+/t, assumed soil bulk density of 1.7t/m^3 and safety factor of 1.5 a treatment application with 3.5kg of agricultural lime per m^3 of soil is recommended. Treatment would need to be managed to ensure soils and neutralisation agent is thoroughly mixed, evenly distributed and material is homogenous. The calculation of this liming rate assumes the use of fine grained agricultural lime ($CaCO_3$) with a purity of not less than 90%. If an alternative type of neutralising agent is intended to be used it may be necessary to assess its effective neutralising properties and adjust the application rate calculations accordingly.

A summary of field screen laboratory test results is provided in Table 5-1. Results of chromium reducible sulfur suite laboratory testing are summarised in

Table 5-2.

Table 5-1: Field screen laboratory testing results summary

TEST LOCATION DEPTH (m)	PH_{-F}	PH_{-FOX}	REACTION RATING	REACTION
SS01_0.0-0.25	6.2	4	4	Extreme
SS01_0.25-0.5	6.1	4.8	3	Strong
SS01_0.5-0.75	6.4	4.9	1	No reaction to slight
SS01_0.75-1.0	6.4	5.2	1	No reaction to slight
SS01_1.0-1.25	5.4	4.6	1	No reaction to slight
SS01_1.25-1.5	5.5	4.6	1	No reaction to slight
SS01_1.5-1.75	5.5	4.3	1	No reaction to slight

TEST LOCATION DEPTH (m)	PH-$_F$	PH-$_{FOX}$	REACTION RATING	REACTION
SS01_1.75-2.0	5.5	4	4	Extreme
SS01_2.0-2.25	5.6	4	4	Extreme
SS01_2.25-2.5	5.6	3.6	1	No reaction to slight
SS01_2.5-2.75	5.2	3.8	1	No reaction to slight
SS01_2.75-3.0	6	3.5	1	No reaction to slight
SS01_3.0-3.25	6.4	4.2	1	No reaction to slight
SS01_3.25-3.5	6.4	4.6	1	No reaction to slight
SS01_3.5-3.75	6.2	4.7	1	No reaction to slight
SS01_3.75-4.0	6.3	4.8	2	Moderate
SS01_4.0-4.25	6.5	4.6	4	Extreme
SS01_4.25-4.5	6.3	5.2	4	Extreme
SS01_4.5-4.75	6.2	5.1	4	Extreme
SS01_4.75-5.0	6.1	4.9	2	Moderate
SS01_5.0-5.25	6.5	5	4	Extreme
SS01_5.25-5.5	6.6	4.9	4	Extreme
SS01_5.5-5.75	6.2	4.5	2	Moderate
SS01_5.75-6.0	6	4.5	2	Moderate
SS01_6.0-6.25	6	4.6	4	Extreme
SS01_6.25-6.5	6.4	4.3	4	Extreme
SS01_6.5-6.75	5.7	3.9	4	Extreme
SS01_6.75-7.0	6.3	5.1	4	Extreme
SS01_7.0-7.25	6.4	5	4	Extreme
SS01_7.25-7.5	6.2	4.7	4	Extreme
SS01_7.5-7.75	5.4	4.6	4	Extreme
SS01_7.75-8.0	5.7	4.7	4	Extreme
SS01_8.0-8.25	5.6	4.4	4	Extreme
SS01_8.25-8.5	5.4	4.4	4	Extreme
SS01_8.5-8.75	6.4	4.4	4	Extreme
SS01_8.75-9.0	6.4	4.8	4	Extreme
SS01_9.0-9.25	6.5	4.2	4	Extreme
SS02_0.0-0.25	5.9	3.1	3	Strong
SS02_0.25-0.5	5.5	3.4	3	Strong

TEST LOCATION DEPTH (m)	PH-$_F$	PH-$_{FOX}$	REACTION RATING	REACTION
SS02_0.5-0.75	5.4	4.2	3	Strong
SS02_0.75-1.0	5.5	5.5	4	Extreme
SS02_1.0-1.25	5.5	5.4	4	Extreme
SS02_1.25-1.5	5.5	5.5	4	Extreme
SS02_1.5-1.75	5.4	5.3	4	Extreme
SS02_1.75-2.0	5.5	5.8	4	Extreme
SS02_2.0-2.25	5.7	5.3	4	Extreme
SS02_2.25-2.5	5.2	5.6	4	Extreme
SS02_2.5-2.75	5.3	5.6	4	Extreme
SS02_2.75-3.0	5.2	5.4	4	Extreme
SS02_3.0-3.25	5.5	5.4	4	Extreme
SS02_3.25-3.5	5.7	5.3	4	Extreme
SS02_3.5-3.75	5.4	5	4	Extreme
SS02_3.75-4.0	5.2	5.2	4	Extreme
SS02_4.0-4.25	5.3	4.9	4	Extreme
SS02_4.25-4.5	5.3	4.7	4	Extreme
SS02_4.5-4.75	5.3	4.3	4	Extreme
SS02_4.75-5.0	5.4	4	4	Extreme
SS03_0.0-0.25	5.8	3.6	3	Strong
SS03_0.25-0.5	5.8	3.2	4	Extreme
SS03_0.5-0.75	5.4	3.8	4	Extreme
SS03_0.75-1.0	5.4	3.8	3	Strong
SS03_1.0-1.25	5.6	3.5	4	Extreme
SS03_1.25-1.5	5.6	4.2	1	No reaction to slight
SS03_1.5-1.75	5.6	4.4	1	No reaction to slight
SS03_1.75-2.0	5.8	4.7	1	No reaction to slight
SS03_2.0-2.25	5.9	4.9	1	No reaction to slight
SS03_2.25-2.5	5.4	4	4	Extreme
SS03_2.5-2.75	5.9	4.8	1	No reaction to slight
SS03_2.75-3.0	5.8	4.6	1	No reaction to slight
SS03_3.0-3.25	5.4	4.8	1	No reaction to slight
SS03_3.25-3.5	5.8	4.7	2	Moderate

TEST LOCATION DEPTH (m)	PH-$_F$	PH-$_{FOX}$	REACTION RATING	REACTION
SS03_3.5-3.75	5.6	4.7	2	Moderate
SS03_3.75-4.0	5.6	4.7	1	No reaction to slight
SS03_4.0-4.2	5.5	4.7	1	No reaction to slight

Table 5-2: Chromium reducible sulfur suite (S_{CR}) laboratory testing summary

TEST LOCATION DEPTH (m)	PH KCL LEVEL	ACTUAL ACIDITY (TAA) MOL H+/TONNE	KCL EXTRACTABLE SULFUR (S_{KCL}) %S	RETAINED ACIDITY (S_{NAS}) MOL H+/TONNE	POTENTIAL ACIDITY (S_{CR}) MOL H+/TONNE	ACID NEUTRALISING CAPACITY (ANC) MOL H+/TONNE	NET ACIDITY MOL H+/TONNE
SS01 2.0-2.25	5.2	16	< 0.02	N/A	< 3	n/a	16
SS01 2.5-2.75	5.4	10	< 0.02	N/A	< 3	n/a	10
SS01 3.0-3.25	6.5	< 2	< 0.02	N/A	< 3	n/a	< 10
SS01 3.5-3.75	6.5	< 2	< 0.02	N/A	< 3	11	< 10
SS01 4.0-4.25	6.5	< 2	< 0.02	N/A	< 3	14	< 10
SS01 4.5-4.75	6.4	< 2	< 0.02	N/A	< 3	n/a	< 10
SS01 5.0-5.25	5.6	4.5	< 0.02	N/A	< 3	n/a	< 10
SS01 5.5-5.75	6.4	< 2	< 0.02	N/A	< 3	n/a	< 10
SS01 6.0-6.25	6.2	< 2	< 0.02	N/A	< 3	n/a	< 10
SS01 6.5-6.75	6.1	2.1	< 0.02	N/A	< 3	n/a	< 10
SS01 7.0-7.25	5.9	3.5	< 0.02	N/A	< 3	n/a	< 10
SS01 7.5-7.75	4.8	23	< 0.02	N/A	< 3	n/a	23
SS01 8.0-8.25	4.9	21	< 0.02	N/A	< 3	n/a	21
SS02 2.25-2.5	5	19	< 0.02	N/A	< 3	n/a	19
SS02 2.75-3.0	5	18	< 0.02	N/A	< 3	n/a	18

TEST LOCATION DEPTH (m)	PH KCL LEVEL	ACTUAL ACIDITY (TAA) MOL H+/TONNE	KCL EXTRACTABLE SULFUR (S_{KCL}) %S	RETAINED ACIDITY (S_{NAS}) MOL H+/TONNE	POTENTIAL ACIDITY (S_{CR}) MOL H+/TONNE	ACID NEUTRALISING CAPACITY (ANC) MOL H+/TONNE	NET ACIDITY MOL H+/TONNE
SS02 3.25-3.5	4.9	22	< 0.02	N/A	< 3	n/a	22
SS02 3.75-4.0	5	17	< 0.02	N/A	< 3	n/a	17
SS02 4.25-4.5	4.9	25	< 0.02	N/A	< 3	n/a	25
SS02 4.75-5.0	5	18	< 0.02	N/A	< 3	n/a	18

5.2 Groundwater Analysis

Groundwater observed during site investigations may be considered to generally exist in the form of unconfined aquifers located in the alluvial profile perched above underlying residual materials influenced by Lake Macdonald hydrogeology.

The interface probe utilised indicated no recordable hydrocarbon layer and no odour (including hydrogen sulfide), iron floccules, or sheen was observed during measurement of standing water levels and sample collection. Groundwater pH levels recorded at both monitoring locations are generally acidic and between 5.39 and 6.59. Total acidity was between 120 mg/L and 130 mg/L in the representative samples analysed. Total alkalinity levels (as $CaCO_3$) at monitoring locations DH4 and BH203 were 52 mg/l and <20 mg/L (below limit of reporting) respectively. Levels below 20 mg/L of total alkalinity provide a limited buffer that can result in rapid pH level reduction. Electrical Conductivity (EC) levels were between 17.0 mS/cm and 21.86 mS/cm, demonstrating fresh groundwater conditions. Reduction Oxidation (REDOX) values in samples ranged between 20 mV and 214 mV during the monitoring event indicating oxidative groundwater conditions exist.

Chloride to sulfate ratio ($Cl:SO_4$) can indicate whether sulfidic material near the site has been oxidised and a $Cl:SO_4$ ratio of less than two could indicate a possible additional source of sulfate from previous sulfide oxidation. Ratios observed at monitoring locations were above 5.4. Interpreting $Cl:SO_4$ ratio results in this environment can have limitations as the sulfate levels were below limit of reporting (<5 mg/L) and the ratio becomes a less reliable indicator as large freshwater inputs such as Lake Macdonald and rainfall events occur in proximity to monitoring locations.

Total iron was 25 mg/L and 81 mg/L at monitoring locations DH4 and BH203 respectively. Total aluminium was 13 mg/L at location DH4 and 46 mg/L at location BH203. Total iron and aluminium concentrations at both monitoring locations exceed suggested dewatering trigger levels of 1 mg/L and 0.15 mg/L respectively for a sensitive wetland or waterway (National Acid Sulfate Soils Guidance - Dewatering of Acid Sulfate Soils 2018).

Groundwater analytes were selected to provide preliminary information on potential indicators of ASS and groundwater chemistry. Analysis of acidity, metals (aluminium and iron), major cations and major anions was carried out. Results of in situ and laboratory testing are provided in Table 5-3.

Table 5-3: Groundwater testing results summary

ANALYTE	UNIT	METHOD	LOCATION DH4	LOCATION BH203
pH	pH Level	In situ Onsite	6.59	5.39
pH	pH Level	Laboratory	6.4	5.4
Temperature	°C	In situ Onsite	21.46	20.34
Electrical Conductivity	mS/cm	In situ Onsite	0.215	0.076

ANALYTE	UNIT	METHOD	LOCATION DH4	LOCATION BH203
Electrical Conductivity	mS/cm	Laboratory	0.14	0.086
Redox	mV	In situ Onsite	20	214
Dissolved Oxygen	mg/L	In situ Onsite	57.4	62.3
Total Dissolved Solids	mg/L	Laboratory	160	59
Total Acidity (as $CaCO_3$)	mg/L	Laboratory	130	120
Total Alkalinity (as $CaCO_3$)	mg/L	Laboratory	52	<20
Bicarbonate Alkalinity (as $CACO_3$)	mg/L	Laboratory	52	<20
Carbonate Alkalinity (as $CaCO_3$)	mg/L	Laboratory	<10	<10
Hydroxide Alkalinity (as $CaCO_3$)	mg/L	Laboratory	<20	<20
Iron	mg/L	Laboratory	25	81
Dissolved Iron	mg/L	Laboratory	20	0.54
Aluminium	mg/L	Laboratory	13	46
Dissolved Aluminium	mg/L	Laboratory	<0.05	<0.05
Ammonia (as N)	mg/L	Laboratory	2.9	<0.01
Chloride	mg/L	Laboratory	28	27
Sulfate (as SO_4)	mg/L	Laboratory	<5	<5
Calcium	mg/L	Laboratory	7.6	0.8
Magnesium	mg/L	Laboratory	6.4	2.7
Potassium	mg/L	Laboratory	1.1	2.3
Sodium	mg/L	Laboratory	17	13
Nitrate (as N)	mg/L	Laboratory	<0.02	0.83
Nitrate and Nitrile (as N)	mg/L	Laboratory	<0.05	0.83
Phosphate Total (as P)	mg/L	Laboratory	<0.05	0.69
Phosphorous Filterable Reactive (as P)	mg/L	Laboratory	<0.05	<0.05
Total Nitrogen (as N)	mg/L	Laboratory	4.5	1.5
Total Kjeldahl Nitrogen (as N)	mg/L	Laboratory	4.5	0.7

6 Risk Assessment

Preliminary acid sulfate soils investigations covered by this report include the on-site observations and laboratory analysis of representative materials from a limited land based geotechnical investigation.

Some titratable actual acidity from representative samples was recorded, up to 25 mol H+/t, and is marginally above an action criterion of 18 mol H+/tonne. Laboratory test results and observations infer the existing acidity is unlikely to be sulfuric in source. Retained or potential sulfuric acidity was below the laboratory limits of reporting in all representative samples. Although not considered to be sulfuric derived acidity, some representative soil samples were below an action criterion of pH_{KCL} 5.5 that would require management actions for any proposed disturbances including neutralisation treatment with consideration of surrounding sensitive receptors. The proposed site is within an area that contains pH sensitive terrestrial, lacustrine and groundwater receiving environments.

A precautionary principle should be applied for inland ASS and pyritic ASR materials in relation to ground and groundwater disturbances. Based on the preliminary acid sulfate soils investigation it is considered that an ASSMP would not be required. It is understood additiontal geotechnical investigations are proposed for the site and the nature and extent of acidity with subsequent investigations and contractors experience with these conditions at Lake Macdonald will be considered. If any conditions not identified in previous site investigations including indicators and laboratory analysis of ASS and ASR are observed or recorded during future works, then all reasonable steps should be taken to implement a management plan. All project works should be in accordance with statutory regulations, project Construction Environment Management Plan (CEMP) and associated project requirements

7 Limitations

7.1 General

We have prepared this report in accordance with the brief. The contents of the report are for the sole use of Seqwater or its engaged contractors for this Project. No responsibility or liability will be accepted to any third party. Data or opinions contained within the report may not be used in other contexts or for any other purposes without prior review and agreement with SMEC.

The recommendations in this report are based on data collected at specific locations using suitable investigation techniques. Only a finite amount of information has been collected to meet the specific financial and technical requirements of the brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the extrapolated model.

Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the provided factual data. They should perform any additional tests as necessary for their own purposes. Subsurface conditions, such as groundwater levels, can change over time and this should be borne in mind, particularly if the findings and/or recommendations contained within this report are used after a protracted delay.

It is strongly recommended that any plans and specifications prepared by others and relating to the content of this report, or any amendments to the original plans and specifications, are reviewed by SMEC to verify that the intent of our recommendations is properly reflected in the design. During construction, we request the opportunity to review our interpretations if the encountered site conditions are significantly different from those inferred in this report.

If this report is reproduced, it must be in full. Should there be any queries concerning this report please do not hesitate to contact the author.

7.2 Notes Relating to Geotechnical Reports

Geotechnical reports are prepared by qualified personnel on the information supplied or obtained and are based on current engineering standards of interpretation and analysis.

Information may be gained from limited subsurface testing, surface observations, and previous work, and is supplemented by knowledge of the local geology and experience of the range of properties that may be exhibited by the materials present. For this reason, geotechnical reports should be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Where the report has been prepared for a specific purpose (e.g. design of a three-storey building), the information and interpretation may not be appropriate if the design is changed (e.g. a twenty-storey building). In such cases, the report and the sufficiency of the existing work should be reviewed by SMEC in the light of the new proposal.

Every care is taken with the report content, however, it is not always possible to anticipate or assume responsibility for the following conditions:

- Unexpected variations in ground conditions. The potential for this depends on the amount of investigative work undertaken.
- Changes in policy or interpretation by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, SMEC would be pleased to resolve the matter through further investigation, analysis or advice.

7.2.1 Unforeseen Conditions

Should conditions encountered on site differ markedly from those anticipated from the information contained in the report, SMEC should be notified immediately. Early identification of site anomalies generally results in any problems being more readily resolved and allows re-interpretation and assessment of the implications for future work.

7.2.2 Subsurface Information

Logs of a boreholes or cone penetration tests are an engineering and/or geological interpretation of the subsurface conditions. The reliability of the logged information depends on the drilling/testing method, sampling/observation spacing's and the ground conditions. It is not always possible or economic to obtain continuous high quality data. It

should also be recognised that the volume of material observed or tested is only a fraction of the total subsurface profile.

Interpretation of subsurface information and application to design and construction must take into consideration the spacing of the test locations, the frequency of observations and testing, and the possibility that geological boundaries may vary between observation points.

Groundwater observations and measurements outside of specially designed and constructed piezometers should be treated with care for the following reasons:

- In low permeability soils, groundwater may not seep into an excavation or bore in the short time it is left open.
- A localised perched water table may not represent the true water table.
- Groundwater levels vary according to rainfall events or season.
- Some drilling and testing procedures mask or prevent groundwater inflow.
- The installation of piezometers and long term monitoring of groundwater levels may be required to adequately identify groundwater conditions.

Appendix A Site Plans

revision	description	Rev						
	Original	A	Sourced from: Google Earth © 2018	drawn	**AS**	SMEC Member of the Surbana Jurong Group	client:	**Seqwater**
	Test Location Reidentification	B		approved	**DT**		project:	**Six Mile Creek Dam Upgrade**
				date	**25/10/2018**		title:	**Test Location Plan**
				scale	**AS SHOWN**		project no: **30031970 A4.13.2**	**Rev B**
				original size	**A3**			

Appendix B Registered Bore Reports

GROUNDWATER DATABASE

BORE REPORT

REG NUMBER 117318

REGISTRATION DETAILS

		BASIN	1381	**LATITUDE**	26-22-38	**MAP-SCALE**	
OFFICE	Bundaberg	**SUB-AREA**		**LONGITUDE**	152-55-41	**MAP-SERIES**	
DATE LOG RECD		**SHIRE**	5740-NOOSA SHIRE COU	**EASTING**	492823	**MAP-NO**	
D/O FILE NO.		**LOT**	27	**NORTHING**	7082538	**MAP NAME**	
R/O FILE NO.		**PLAN**	RP899377	**ZONE**	56	**PROG SECTION**	
H/O FILE NO.		**ORIGINAL DESCRIPTION**		**ACCURACY**	GPS	**PRES EQUIPMENT**	
				GPS ACC	10		
GIS LAT	-26.377297861	**PARISH NAME**	4508-TEWANTIN			**ORIGINAL BORE NO**	
GIS LNG	152.928008014	**COUNTY**	MARCH			**BORE LINE**	-
CHECKED	Y						
						POLYGON	
						RN OF BORE REPLACED	
FACILITY TYPE	Sub-Artesian Facility	**DATE DRILLED**	22/12/2003			**DATA OWNER**	
STATUS	Existing	**DRILLERS NAME**	GRAEME BAKER				
ROLES	WS	**DRILL COMPANY**	NOOSA WATER DRILLERS				
		METHOD OF CONST.	ROTARY AIR				

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	22/12/2003	1	Polyvinyl Chloride	9.000	WT	140	0.00	31.00
A	22/12/2003	2	Perforated or Slotted Casing	1.000	AP	140	19.00	31.00
A	22/12/2003	3	Gravel Pack	7.000	GR		5.00	31.00
A	22/12/2003	4	Grout			175	0.00	9.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.00	TOP SOIL
2	1.00	5.00	CLAY
3	5.00	20.00	WEATHERED SANDSTONE
4	20.00	24.00	PINK SANDSTONE
5	24.00	26.00	GREY SANDSTONE

BORE REPORT

REG NUMBER 117318

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
6	26.00	31.00	PINK SANDSTONE *

STRATIGRAPHY DETAILS

****** NO RECORDS FOUND ******

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	28.00		SDST	22/12/2003	-6.00	N	POTABLE	1.38	Y	UC	

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	22/12/2003	1	117318				PUM		AIR	31.00				

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	22/12/2003	1	90	-6.00								1.38		31.00		

BORE CONDITION

****** NO RECORDS FOUND ******

ELEVATION DETAILS

****** NO RECORDS FOUND ******

WATER ANALYSIS PART1

****** NO RECORDS FOUND ******

WATER ANALYSIS PART 2

****** NO RECORDS FOUND ******

BORE REPORT

REG NUMBER 117318

WATER LEVEL DETAILS

****** NO RECORDS FOUND ******

WIRE LINE LOG DETAILS

****** NO RECORDS FOUND ******

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK (mEq)	METH	SOURCE
A	22/12/2003		620							PU	GB

SPECIAL WATER ANALYSIS

****** NO RECORDS FOUND ******

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**** End of Report. Produced:** 18/09/2018 01:25:11 PM ******

GROUNDWATER DATABASE

BORE REPORT

REG NUMBER 150598

REGISTRATION DETAILS

		BASIN	1381	**LATITUDE**	26-22-38	**MAP-SCALE**	
OFFICE	Bundaberg	**SUB-AREA**		**LONGITUDE**	152-55-28	**MAP-SERIES**	
DATE LOG RECD	23-FEB-10	**SHIRE**	5740-NOOSA SHIRE COU	**EASTING**	492460	**MAP-NO**	
D/O FILE NO.		**LOT**	7	**NORTHING**	7082551	**MAP NAME**	
R/O FILE NO.		**PLAN**	SP213099	**ZONE**	56	**PROG SECTION**	
H/O FILE NO.		**ORIGINAL DESCRIPTION**		**ACCURACY**	UNKN	**PRES EQUIPMENT**	
				GPS ACC			
GIS LAT	-26.3771068	**PARISH NAME**	4508-TEWANTIN			**ORIGINAL BORE NO**	
GIS LNG	152.9244144	**COUNTY**	MARCH			**BORE LINE**	-
CHECKED	Y						
						POLYGON	
						RN OF BORE REPLACED	
FACILITY TYPE	Sub-Artesian Facility	**DATE DRILLED**	06/10/2009			**DATA OWNER**	
STATUS	Existing	**DRILLERS NAME**	GRIFFITHS, NATHAN WAYNE				
ROLES		**DRILL COMPANY**	NRG DRILLING				
		METHOD OF CONST.	ROTARY AIR				

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	06/10/2009	1	Polyvinyl Chloride	6.000	WT	125	0.00	19.00
A	06/10/2009	2	Perforated or Slotted Casing	3.000	AP	125	13.00	19.00
X	06/10/2009	3	Gravel Pack	5.000	GR		8.00	19.00
X	06/10/2009	4	Bentonite Seal				6.00	8.00
X	06/10/2009	5	Grout			200	0.00	6.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.50	TOP SOIL
2	1.50	6.00	CLAY
3	6.00	11.00	GREEN SANDSTONE
4	11.00	18.00	BROKEN LIMESTONE

BORE REPORT

REG NUMBER 150598

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
5	18.00	19.00	FIRM LIMESTONE

STRATIGRAPHY DETAILS

****** NO RECORDS FOUND ******

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	18.00		LMST	06/10/2009	-7.00	N		3.20		FR	

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	06/10/2009	1	150598	18.00			PUM		AIR	18.00				

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	06/10/2009	1	180	-7.00								3.20		18.00		

BORE CONDITION

****** NO RECORDS FOUND ******

ELEVATION DETAILS

****** NO RECORDS FOUND ******

WATER ANALYSIS PART1

****** NO RECORDS FOUND ******

WATER ANALYSIS PART 2

****** NO RECORDS FOUND ******

BORE REPORT

REG NUMBER 150598

WATER LEVEL DETAILS

****** NO RECORDS FOUND ******

WIRE LINE LOG DETAILS

****** NO RECORDS FOUND ******

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK (mEq)	METH	SOURCE
A	06/10/2009	19.00	150							PU	GB

SPECIAL WATER ANALYSIS

****** NO RECORDS FOUND ******

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GROUNDWATER DATABASE

BORE REPORT

REG NUMBER 164371

REGISTRATION DETAILS

		BASIN	1381	**LATITUDE**	26-23-13	**MAP-SCALE**	
OFFICE	Bundaberg	**SUB-AREA**		**LONGITUDE**	152-53-31	**MAP-SERIES**	
DATE LOG RECD	03-APR-14	**SHIRE**	5740-NOOSA SHIRE COU	**EASTING**	489222	**MAP-NO**	
D/O FILE NO.		**LOT**	8	**NORTHING**	7081459	**MAP NAME**	
R/O FILE NO.		**PLAN**	RP901387	**ZONE**	56	**PROG SECTION**	
H/O FILE NO.		**ORIGINAL DESCRIPTION**		**ACCURACY**	UNKN	**PRES EQUIPMENT**	
				GPS ACC			
GIS LAT	-26.38402457	**PARISH NAME**	4508-TEWANTIN			**ORIGINAL BORE NO**	
GIS LNG	152.9254315	**COUNTY**	MARCH			**BORE LINE**	-
CHECKED	Y						
						POLYGON	
						RN OF BORE REPLACED	
FACILITY TYPE	Sub-Artesian Facility	**DATE DRILLED**	26/02/2014			**DATA OWNER**	
STATUS	Existing	**DRILLERS NAME**	GIBSON, MURRAY ALAN				
ROLES		**DRILL COMPANY**	GIBSON DRILLING SERVICES				
		METHOD OF CONST.	ROTARY AIR				

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	26/02/2014	1	Polyvinyl Chloride	5.000	WT	125	0.00	13.00
A	26/02/2014	2	Polyvinyl Chloride	5.000	WT	125	22.00	23.00
A	26/02/2014	3	Perforated or Slotted Casing	3.000	AP	125	13.00	22.00
X	26/02/2014	4	Gravel Pack		GR	125	12.50	23.00
X	26/02/2014	5	Bentonite Seal			125	11.50	12.50
X	26/02/2014	6	Cuttings or other fill between casing and ho			125	6.00	11.50
X	26/02/2014	7	Grout			200	0.00	6.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.00	TOP SOIL
2	1.00	5.00	BROWN CLAY

BORE REPORT

REG NUMBER 164371

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
3	5.00	12.00	ORANGE SOFT CLAY
4	12.00	16.00	GREY SHALE
5	16.00	23.00	GREY BASALT

STRATIGRAPHY DETAILS

****** NO RECORDS FOUND ******

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	21.00		BSLT	26/02/2014	-3.50	N	POTABLE	6.99	Y	PS	KIN KIN BEDS

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	26/02/2014	1	164371	21.00					AIR	22.00				

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	26/02/2014	1	60	-3.50								6.99		22.00		

BORE CONDITION

****** NO RECORDS FOUND ******

ELEVATION DETAILS

****** NO RECORDS FOUND ******

WATER ANALYSIS PART1

****** NO RECORDS FOUND ******

BORE REPORT

REG NUMBER 164371

WATER ANALYSIS PART 2

****** NO RECORDS FOUND ******

WATER LEVEL DETAILS

****** NO RECORDS FOUND ******

WIRE LINE LOG DETAILS

****** NO RECORDS FOUND ******

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK (mEq)	METH	SOURCE
A	26/02/2014	23.00								PU	GB

SPECIAL WATER ANALYSIS

****** NO RECORDS FOUND ******

BORE REPORT

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GROUNDWATER DATABASE

BORE REPORT

REG NUMBER 174121

REGISTRATION DETAILS

		BASIN	1381	**LATITUDE**	26-23-20	**MAP-SCALE**	
OFFICE	Bundaberg	**SUB-AREA**		**LONGITUDE**	152-55-40	**MAP-SERIES**	
DATE LOG RECD	03-JAN-17	**SHIRE**	5740-NOOSA SHIRE COU	**EASTING**	492789	**MAP-NO**	9445-22411
D/O FILE NO.		**LOT**	6	**NORTHING**	7081231	**MAP NAME**	
R/O FILE NO.		**PLAN**	RP187353	**ZONE**	56	**PROG SECTION**	
H/O FILE NO.		**ORIGINAL DESCRIPTION**	LOG #2007381	**ACCURACY**	GPS	**PRES EQUIPMENT**	
				GPS ACC	10		
GIS LAT	-26.38902425	**PARISH NAME**	6000-NO LONGER USED			**ORIGINAL BORE NO**	
GIS LNG	152.9277062	**COUNTY**				**BORE LINE**	-
CHECKED	Y						
						POLYGON	
						RN OF BORE REPLACED	
FACILITY TYPE	Sub-Artesian Facility	**DATE DRILLED**	09/11/2016			**DATA OWNER**	
STATUS	Existing	**DRILLERS NAME**	GRIFFIN, THOMAS				
ROLES	WS	**DRILL COMPANY**	WELLMASTER WATER BORES				
		METHOD OF CONST.	ROTARY AIR				

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	09/11/2016	1	Polyvinyl Chloride	5.900	WT	140	0.00	37.00
A	09/11/2016	2	Perforated or Slotted Casing	2.000	AP	240	25.00	37.00
X	09/11/2016	3	Gravel Pack	5.000	GR	180	5.00	37.00
X	09/11/2016	4	Grout			200	0.00	5.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.00	SANDY TOPSOIL
2	1.00	9.00	RED CLAY
3	9.00	14.00	WHITE CLAY
4	14.00	21.00	BROWN CLAY
5	21.00	37.00	SANDSTONE

BORE REPORT

REG NUMBER 174121

STRATIGRAPHY DETAILS

**** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	21.00	37.00	SDST	09/11/2016	-15.00	N	SALINITY	4.00	Y	PS	KIN KIN BEDS

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	09/11/2016	1	174121	21.00	37.00				AIR					

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	09/11/2016	1	120	-15.00								4.00				

BORE CONDITION

**** NO RECORDS FOUND ****

ELEVATION DETAILS

**** NO RECORDS FOUND ****

WATER ANALYSIS PART1

**** NO RECORDS FOUND ****

WATER ANALYSIS PART 2

**** NO RECORDS FOUND ****

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

BORE REPORT

REG NUMBER 174121

****** NO RECORDS FOUND ******

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK (mEq)	METH	SOURCE
A	09/11/2016		313							AI	GB

SPECIAL WATER ANALYSIS

****** NO RECORDS FOUND ******

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GROUNDWATER DATABASE

BORE REPORT

REG NUMBER 174259

REGISTRATION DETAILS

		BASIN	1381	**LATITUDE**	26-23-25	**MAP-SCALE**	
OFFICE	Bundaberg	**SUB-AREA**		**LONGITUDE**	152-55-45	**MAP-SERIES**	
DATE LOG RECD	20-MAR-17	**SHIRE**	5740-NOOSA SHIRE COU	**EASTING**	492943	**MAP-NO**	9445-22411
D/O FILE NO.		**LOT**	1	**NORTHING**	7081085	**MAP NAME**	
R/O FILE NO.		**PLAN**	SP108094	**ZONE**	56	**PROG SECTION**	
H/O FILE NO.		**ORIGINAL DESCRIPTION**	LOG #2007660	**ACCURACY**	GPS	**PRES EQUIPMENT**	
				GPS ACC	10		
GIS LAT	-26.39034331	**PARISH NAME**	6000-NO LONGER USED			**ORIGINAL BORE NO**	
GIS LNG	152.92924932	**COUNTY**				**BORE LINE**	-
CHECKED	Y						
						POLYGON	
						RN OF BORE REPLACED	
FACILITY TYPE	Sub-Artesian Facility	**DATE DRILLED**	02/03/2017			**DATA OWNER**	
STATUS	Existing	**DRILLERS NAME**	STOLZENBERG, KEVIN DUDLEY				
ROLES	WS	**DRILL COMPANY**	STOLZENBERG DRILLING				
		METHOD OF CONST.	ROTARY AIR				

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	02/03/2017	1	Polyvinyl Chloride	5.800	WT	140	0.00	79.20
A	02/03/2017	2	Perforated or Slotted Casing	4.000	AP	150	18.30	79.20
X	02/03/2017	3	Grout			254	0.00	5.80
X	02/03/2017	4	Bentonite Seal			254	5.80	6.10
X	02/03/2017	5	Gravel Pack			254	6.10	79.20

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	0.60	SOIL
2	0.60	16.80	CLAY YELLOW BROWN WHITE *
3	16.80	53.30	SANDSTONE GREY *
4	53.30	54.00	MUDSTONE SANDY

BORE REPORT

REG NUMBER 174259

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
5	54.00	71.60	SANDSTONE GREY *
6	71.60	73.20	SANDY MUDSTONE
7	73.20	79.20	SANDSTONE GREY

STRATIGRAPHY DETAILS

****** NO RECORDS FOUND ******

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	0.60	16.80	CLAY	02/03/2017	-9.40	N	POTABLE	0.06	N	UC	
2	16.80	53.30	SDST	02/03/2017	-9.40	N	POTABLE	0.75	N	UC	
3	54.90	71.60		02/03/2017	-9.40	N	POTABLE	1.25	Y	UC	

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	02/03/2017	1	174259	0.60	71.60					78.20				

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	02/03/2017	1	120	-9.40								1.25		78.20		

BORE CONDITION

****** NO RECORDS FOUND ******

ELEVATION DETAILS

****** NO RECORDS FOUND ******

BORE REPORT

REG NUMBER 174259

WATER ANALYSIS PART1

****** NO RECORDS FOUND ******

WATER ANALYSIS PART 2

****** NO RECORDS FOUND ******

WATER LEVEL DETAILS

****** NO RECORDS FOUND ******

WIRE LINE LOG DETAILS

****** NO RECORDS FOUND ******

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK (mEq)	METH	SOURCE
A	02/03/2017	78.20	600							NR	GB

SPECIAL WATER ANALYSIS

****** NO RECORDS FOUND ******

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GROUNDWATER DATABASE

BORE REPORT

REG NUMBER 174777

REGISTRATION DETAILS

		BASIN	1381	**LATITUDE**	26-17-32	**MAP-SCALE**	
OFFICE	Bundaberg	**SUB-AREA**		**LONGITUDE**	152-55-44	**MAP-SERIES**	
DATE LOG RECD	13-DEC-17	**SHIRE**	5740-NOOSA SHIRE COU	**EASTING**	492888	**MAP-NO**	9445-22411
D/O FILE NO.		**LOT**	1	**NORTHING**	7091937	**MAP NAME**	
R/O FILE NO.		**PLAN**	RP143356	**ZONE**	56	**PROG SECTION**	
H/O FILE NO.		**ORIGINAL DESCRIPTION**	LOG #2009759	**ACCURACY**	GPS	**PRES EQUIPMENT**	
				GPS ACC	10		
GIS LAT	-26.383118893	**PARISH NAME**	6000-NO LONGER USED			**ORIGINAL BORE NO**	
GIS LNG	152.9285465739	**COUNTY**				**BORE LINE**	-
CHECKED	Y						
						POLYGON	
						RN OF BORE REPLACED	
FACILITY TYPE	Sub-Artesian Facility	**DATE DRILLED**	12/12/2017			**DATA OWNER**	
STATUS	Existing	**DRILLERS NAME**	PARTLETON, THOMAS				
ROLES	WS	**DRILL COMPANY**	GEODRILL				
		METHOD OF CONST.	ROTARY AIR				

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	12/12/2017	1	Polyvinyl Chloride	5.900	WT	140	0.00	30.00
A	12/12/2017	2	Polyvinyl Chloride	1.000	AP	140	12.00	30.00
X	12/12/2017	3	Grout			187	0.00	5.00
X	12/12/2017	4	Gravel Pack			187	5.00	30.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	5.50	MOIST RED CLAY
2	5.50	9.00	WEATHERED SANDSTONE RED & ORANGE
3	9.00	15.00	ORANGE SANDSTONE HARD
4	15.00	15.00	ORANGE SANDSTONE HARD *
5	15.00	30.00	GREY/ORANGE SANDSTONE

BORE REPORT

REG NUMBER 174777

STRATIGRAPHY DETAILS

**** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	15.00	15.00	SDST	12/12/2017	-2.00	N	70 PPM	0.50	Y	PS	

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	12/12/2017	1	174777	15.00	15.00				AIR					

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	12/12/2017	1	60	-2.00								0.50				

BORE CONDITION

**** NO RECORDS FOUND ****

ELEVATION DETAILS

**** NO RECORDS FOUND ****

WATER ANALYSIS PART1

**** NO RECORDS FOUND ****

WATER ANALYSIS PART 2

**** NO RECORDS FOUND ****

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

BORE REPORT

REG NUMBER 174777

****** NO RECORDS FOUND ******

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK (mEq)	METH	SOURCE
A	12/12/2017	2.00	109							AI	GB

SPECIAL WATER ANALYSIS

****** NO RECORDS FOUND ******

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**** End of Report. Produced:** 18/09/2018 01:16:04 PM ******

Appendix C Explanatory Notes

Member of the Surbana Jurong Group

local people
global experience

Explanatory Notes of Abbreviations and Terms

Used on Borehole and Excavation Logs

General

Information obtained from site investigations is recorded on log sheets. The “Engineering Log – Borehole or Non Cored Borehole” presents data from drilling operations where a core barrel has not been used to recover material, and information is based on a combination of regular sampling and in-situ testing. The material penetrated in non-core drilling is commonly soil but may include rock. The “Engineering Log – Cored Borehole” presents data from drilling operations where a core barrel has been used to recover material – commonly rock. The “Engineering Log - Excavation” presents data obtained on the subsurface profile from observations of excavations, either natural or man-made. It may contain a scaled, graphical presentation of the typical excavation profile. Refusal of the excavation plant is noted should it occur.

As far as is practicable, the data contained on the log sheets is factual. Some interpretation is inevitable in the assessment of material boundaries in areas of partial sampling, the location of areas of core loss, description and classification of material, estimation of strength and identification of drilling induced fractures. Material description and classification is generally based on AS1726-2017.

Drilling Method

Code	Description
ADT	Auger drilling with TC-bit
ADV	Auger drilling V-bit
AS	Auger screwing
AT	Air track
CA	Casing advancer
CC	Concrete core
CTR	Cable tool rig
DB	Wash bore drag bit
HA	Hand auger
HAND	Hand methods
HF	Hollow flight auger
HMLC	Diamond core 62mm diameter
HQ	Wire line core barrel 64mm diameter
HQ3	Wire line core barrel 62mm diameter
NDD	Non destructive drilling
NMLC	Diamond core 52mm diameter
NQ	Wire line core barrel 47mm diameter
NQ3	Wire line core barrel 45mm diameter
PT	Continuous push tube
PQ	Wire line core barrel 85mm diameter
RAB	Rotary air blast
RC	Reverse circulation
RD	Rotary blade or drag bit
RR	Rock roller
RT	Rotary tricone bit
SD	Sonic drilling
TBX	Tube-X
VC	Vibro-core drilling
WB	Wash bore drilling

Drilling Penetration

Ease of penetration in non-core drilling

VE	Very easy
E	Easy
F	Firm
H	Hard
VH	Very hard

Support and Casing

Code	Description	Code	Description
C	Casing	Hw	114.3 mm
M	Mud	NW	88.9 mm
W	Water	PVC	150 mm

Core Run

Core lifts are identified by a line and depth with core loss per run as a percentage. Core loss is shown in the core run unless otherwise indicated.

Defect Spacing

The average distance between defects is measured parallel to the core axis in mm and may be expressed as a range or average.

Angle / Orientation

Angle from horizontal and orientation to magnetic north.

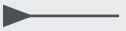
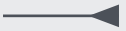
For inclined cored boreholes the Alpha and Beta angles are presented for orientated core. Alpha (α) is measured relative to the core axis, whilst Beta (β) is measured clockwise from the reference line looking down the core axis in the direction of drilling.

Excavation Method

N	Natural exposure
X	Existing excavation
BB	Tractor mounted backhoe bucket
EX	Hydraulic excavator
EH	Hydraulic excavator with hammer
B	Bulldozer blade
R	Ripper

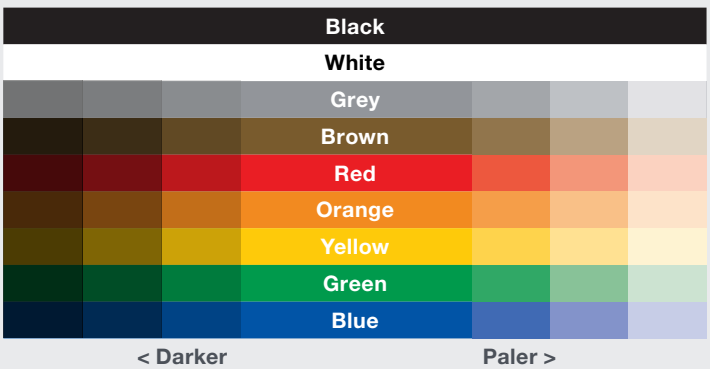
Water / Drilling Fluid

The drilling fluid used is identified and loss of return to the surface is estimated as a percentage, generally of each core lift.

Symbol	Description
	Water inflow
	Water outflow
	Water level: during drilling or immediately after completion of drilling
	Groundwater level with date observed prior to introduction of fluids or after standpipe construction
Not observed	The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole / test pit.
Not encountered	The borehole / test pit was dry soon after excavation, however groundwater could be present in less permeable strata. Inflow may have been observed had the borehole / test pit been left open for a longer period.

Colour

The colour of a soil or rock is described in a moist/wet condition using simple terms, such as black, white, grey, red, brown, orange, yellow green or blue. These are modified as necessary by 'pale', 'dark' or 'mottled'. Borderline colours are described as a combination of these colours (e.g. orange-brown). Where a soil or rock consists of a primary colour with a secondary mottling it is described as (primary colour) mottled (first colour) and (secondary colour).



Description of Soil

i. Soil name (BLOCK LETTERS)

ii. Plasticity or particle size of soil

iii. Colour

iv. Secondary soil components names & estimated proportions, including their plasticity / particle characteristics, colour

v. Minor soil components name, estimated proportions, including their plasticity / particle characteristics, colour

vi. Other minor soil components

vii. Moisture condition

viii. Consistency / density

ix. Structure of soil, geological origin

x. Additional observations

Particle Size

Term		Grain Size
Clay		< 2 µm
Silt		2 – 75 µm
Sand	Fine	0.075 – 0.21 mm
	Medium	0.21 – 0.6 mm
	Coarse	0.6 – 2.36 mm
Gravel	Fine	2.36 – 6.7 mm
	Medium	6.7 – 19 mm
	Coarse	19 – 63 mm
Cobbles		63 – 200 mm
Boulders		> 200 mm

Fine Grained and Coarse Grained Soils

Term	Description
Fine Grained Soil (cohesive)	More than 35% of the material less than 63 mm is smaller than 0.075 mm (silts and clays)
Coarse Grained Soil	More than 65% of the material less than 63 mm is larger than 0.075 mm (sands, gravels and cobbles)

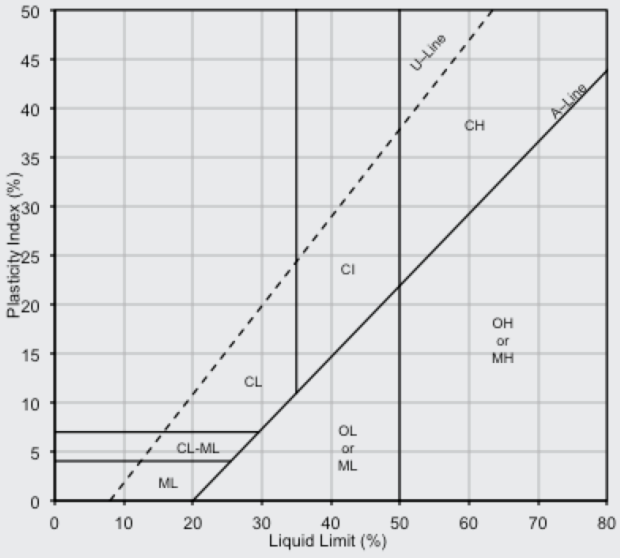
Descriptive Terms for Secondary and Minor Components

Designation of Components	In coarse grained soils				In fine grained soils	
	% Fines	Terminology	% Accessory coarse fraction	Terminology	% Sand / Gravel	Terminology
Minor	≤5	trace	≤15	trace	≤15	trace
	>5, ≤12	with	>15, ≤30	with	>15, ≤30	with
Secondary	>12	prefix	>30	prefix	>30	prefix

Plasticity – Fine Grained Soils

Liquid Limit (LL) %	Description
≤ 35	Low plasticity (L)
>35 to ≤ 50	Medium plasticity (I)
> 50	High plasticity (H)

Plasticity Chart– Fine Grained Soils



Consistency Terms – Fine Grained Soils

Term	Undrained shear strength (kPa)	Indicative SPT (N) Blow Count	Field Guide to Consistency
Very Soft (VS)	<12	0 – 2	Easily penetrated several centimetres by fist, exudes between fingers when squeezed in fist
Soft (S)	12 – 25	2 – 4	Easily penetrated several centimetres by thumb, easily moulded by light finger pressure
Firm (F)	25 – 50	4 – 8	Can be penetrated several centimetres by thumb with moderate effort, and moulded between the fingers by strong pressure
Stiff (St)	50 – 100	8 – 15	Readily indented by thumb but penetrated only with difficultly. Cannot be moulded by fingers
Very Stiff (VSt)	100 – 200	15 –30	Readily indented by thumb nail, still very tough
Hard (H)	>200	>30	Indented with difficulty by thumb nail, brittle
Friable (Fr)	-		Can be easily crumbled or broken into small pieces

Density Terms – Coarse Grained Soils

Term	Density Index (%)	SPT (N) Blow Count
Very Loose (VL)	< 15	0 – 4
Loose (L)	15 – 35	4 – 10
Medium Dense (MD)	35 – 65	10 – 30
Dense (D)	65 – 85	30 – 50
Very Dense (VD)	> 85	>50

Particle Characteristics – Coarse Grained Soils

Term	Description
Well Graded	Having good representation of all particle sizes
Poorly graded	With one or more intermediate size poorly represented
Gap graded	With one or more intermediate sizes absent
Uniform	Essentially of one size

Angularity – Coarse Grained Soils

	Rounded
	Sub-rounded
	Angular
	Sub-angular

Origin of Soil

Fill	Formed by humans
Aeolian	Formed by wind
Alluvial	Formed by streams and rivers
Colluvial	Formed on slopes (talus)
Estuarine	Formed in marine environments
Lacustrine	Formed in lakes
Residual	Formed by weathering insitu

Soil Moisture

	Term	Code	Description
Coarse Grained	Dry	D	Looks and feels dry and free running
	Moist	M	Soil feels cool, darkened in colour, soils tend to stick together, soil grains do not run freely through fingers and no visible free water
	Wet	W	Soil feels cool, darkened in colour, soils tend to stick together, free water on remoulding
Fine Grained	Moist, Less than Plastic Limit	W < PL	Hard and friable or powdery, moisture content well below Plastic Limit
	Moist, Near Plastic Limit	W ≈ PL	Soil feels cool, darkened in colour, can be moulded, near Plastic Limit
	Moist, Wet of Plastic Limit	W > PL	Soil feels cool, dark, usually weakened, free water, moisture content well above Plastic Limit
	Wet, Near Liquid Limit	W ≈ LL	Soil exudes easily
	Wet, Wet of Liquid Limit	W > LL	Soil behaves as a liquid

Boundary Classifications

Soils possessing characteristics of two groups are designated by combinations of group symbols. For example, GW-GC, well graded gravel-sand mixture with clay binder.

Graphic Symbols

	Asphalt		MH
	CH		ML
	CI		OH
	CL		OL
	Concrete		PT
	Fill		SC
	GC		SM
	GM		SP
	GP		SW
	GW		

Soil Classification

Soils are described in general accordance with AS1726-2017 as shown below.

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 63 mm and basing fractions on estimated mass)						GROUP SYMBOL	PRIMARY NAME
COARSE GRAINED SOILS More than 65% of the material is less than 63 mm and is larger than 0.075 mm	A particle size of 0.075 is about the smallest size distinguishable to the naked eye	**GRAVELS** More than half of coarse fraction is larger than 2.36 mm	**CLEAN GRAVELS** (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		GW	GRAVEL
				Predominantly one size or a range of sizes with more intermediate sizes missing, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		GP	GRAVEL
			GRAVELS w/ FINES (Appreciable amount of fines)	'Dirty' materials with excess of non-plastic fines, none to medium dry strength; ≥ 12% silty fines		GM	SILTY GRAVEL
				'Dirty' materials with excess of plastic fines, medium to high dry strength; ≥ 12% clayey fines		GC	CLAYEY GRAVEL
		SANDS More than half of coarse fraction is smaller than 2.36 mm	**CLEAN SANDS** (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		SW	SAND
				Predominantly one size or a range of sizes with more intermediate sizes missing, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		SP	SAND
			SANDS w/ FINES (Appreciable amount of fines)	'Dirty' materials with excess of non-plastic fines, none to medium dry strength; ≥ 12% silty fines		SM	SILTY SAND
				'Dirty' materials with excess of plastic fines, medium to high dry strength; ≥ 12% clayey fines		SC	CLAYEY SAND
FINE GRAINED SOILS More than 35% of the material less than 63 mm is less than 0.075 mm		**IDENTIFICATION PROCEDURES ON FRACTIONS** < 0.075 mm					
		SILTS AND CLAYS Liquid Limit < 50%	**DRY STRENGTH**	**DILATANCY**	**TOUGHNESS**	**GROUP SYMBOL**	**PRIMARY NAME**
			None to low	Slow to rapid	Low	ML	SILT
			Medium to high	≥ 12% clayey fines	Medium	CL, CI	CLAY
			Low to medium	Slow	Low	OL	ORGANIC SILT
		SILTS AND CLAYS Liquid Limit > 50%	Low to medium	None to slow	Low to medium	MH	SILT
			High to very high	None	High	CH	CLAY
			Medium to high	None to very slow	Low to medium	OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS: readily identified by colour, odour, spongy feel and frequently fibrous texture						PT	PEAT

Appendix D Borehole Engineering Logs

NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : SS01

CLIENT : SEQ WATER
LOCATION :
PROJECT: LAKE MACDONALD
PROJECT NUMBER : 30031970
SHEET : 1 OF 1
FINAL DEPTH : 9.3 m

POSITION : E: 493067.0, N: 7082109.0 (MGA94 Zone 56) SURFACE ELEVATION : 88.50 (AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : GEOPROBE 7720 DT MOUNTING : TRACK CONTRACTOR : NUMAC HOLE DIA : 100 mm

DATE STARTED : 05/09/2018 DATE COMPLETED : 05/09/2018 DATE LOGGED : 05/09/2018 LOGGED BY : AS CHECKED BY : OP

DRILLING | MATERIAL

PROGRESS: DRILLING & CASING	PROGRESS: DRILLING FLUID	PENETRATION VE–F–VH	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION (SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components; ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components)	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA				ES 0.25m	88.0	0.0		SM	0.15m **Silty SAND:** fine to coarse grained, brown, low plasticity fines, trace of fine organics <5mm Ø roots			**TOPSOIL**
				ES 0.50m				SC	0.50m **Clayey SAND:** fine to coarse grained, orange/brown, high plasticity fines, trace of fine to medium grained angular gravel			**FILL**
				ES 0.75m				SC	0.90m **Clayey SAND:** fine to coarse grained, brown, medium to high plasticity fines, trace of organics <5mm Ø roots	M		
				ES 1.00m		1.0			**CLAY:** high plasticity fines, orange/brown, pale brown mottle, with some fine to coarse grained sand			
				ES 1.25m	87.0			CH				
				ES 1.50m								
			05/09/18	ES 1.75m								
				ES 2.00m		2.0			2.30m			2.20: PP = 120kPa
				ES 2.25m								
				ES 2.50m	86.0				**SAND:** fine to coarse grained, pale brown, trace of low to medium plasticity fines			**ALLUVIUM**
				ES 2.75m								2.50: Nil odour
				ES 3.00m		3.0						
				ES 3.25m								
PT				ES 3.50m	85.0							
				ES 3.75m								
				ES 4.00m		4.0			...colour changing to pale brown/grey			
				ES 4.25m								
				ES 4.50m	84.0							
				ES 4.75m								
				ES 5.00m		5.0		SP				
				ES 5.25m								
				ES 5.50m	83.0					W		
				ES 5.75m					...trace of fine to medium grained sub-angular/sub-rounded gravel			5.50: Gravel observed as pale grey quartz
				ES 6.00m		6.0						
				ES 6.25m								
				ES 6.50m	82.0							
				ES 6.75m								
				ES 7.00m		7.0			7.00m			
				ES 7.25m				GP	**Sandy GRAVEL:** fine to medium sub-rounded grained, grey/brown, fine to coarse grained sand, with some low to medium plasticity fines			
				ES 7.50m	81.0				7.40m			**RESIDUAL SOIL**
				ES 7.75m				CH	**Sandy CLAY:** high plasticity, grey, orange/brown mottle, fine to coarse grained sand			7.70: PP = 100kPa
				ES 8.00m		8.0			8.10m			7.90: PP = 80kPa
				ES 8.25m					**Clayey SAND:** fine to coarse grained, grey, low to medium plasticity fines			
				ES 8.50m	80.0							8.40: PP = 110kPa
				ES 8.75m				SC				
				ES 9.00m		9.0						
PT				ES					9.30m			9.10: EXTREMELY WEATHERED MATERIAL
					79.0				Hole Terminated at 9.30 m			9.30: PUSH TUBE REFUSAL
						10.0						

ADT — No Fluid

METHOD

HA	Hand auger
AS	Auger screwing
ADV	Auger drilling with V bit
ADT	Auger drilling with TC bit
HF	Hollow flight auger
WB	Wash-bore drilling
RR	Rock roller
SD	Sonic drilling
NDD	Non destructive drilling
PT	Continuous push tub
HAND	Hand methods

PENETRATION

VE – E – F – H – VH
No Resistance
Very Hard / Refusal

WATER

dd/mm/yy Level on Date shown
Drilling water level
water inflow
water outflow

SAMPLES & FIELD TESTS

B	Bulk Disturbed Sample
D	Disturbed Sample
U	Undisturbed Sample
ES	Environmental Sample
W	Water Sample
HP	Hand Penetrometer (kPa)
SPT	Standard Penetration Test
N	Result of SPT (*=sample taken)
R	Hammer Bouncing / Refusal
U50	Undisturbed Sample (50mm dia)
U75	Undisturbed Sample (75mm dia)
VS	Vane Shear; peak/remouded(kPa)
PT	Push Tube
MC	Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE

D	Dry
M	Moist
W	Wet
PL	Plastic limit
LL	Liquid limit

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
Fb	- Friable
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : SS02

CLIENT : SEQ WATER
LOCATION :
PROJECT: LAKE MACDONALD
PROJECT NUMBER : 30031970
SHEET : 1 OF 1
FINAL DEPTH : 5 m

POSITION : E: 493116.0, N: 7082103.0 (MGA94 Zone 56) SURFACE ELEVATION : 89.75 (AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : GEOPROBE 7720 DT MOUNTING : TRACK CONTRACTOR : NUMAC HOLE DIA : 100 mm

DATE STARTED : 05/09/2018 DATE COMPLETED : 05/09/2018 DATE LOGGED : 05/09/2018 LOGGED BY : AS CHECKED BY : OP

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: DRILLING FLUID	PENETRATION: VE / F / H / VH	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	STRUCTURE & Other Observations
HA	No Fluid		05/09/18	ES 0.25m	89.0	0.0		SM	0.10m **Silty SAND:** fine to coarse grained, dark brown, low plasticity fines, trace of organics	M		**TOPSOIL**
				ES 0.50m				SM	0.40m **Silty SAND:** fine to coarse grained, dark brown, low plasticity fines			**FILL**
				ES 0.75m				SC	0.70m **Clayey SAND:** fine to coarse grained, brown, medium plasticity fines			
				ES 1.00m		1.0			**CLAY:** high plasticity, orange/brown, red/brown mottle, trace of fine to coarse grained sand			
				ES 1.25m								
				ES 1.50m								
				ES 1.75m	88.0			CH				
				ES 2.00m		2.0						
				ES 2.25m								
				ES 2.50m								
				ES 2.75m	87.0				2.70m			
				ES 3.00m		3.0			**Sandy CLAY:** high plasticity fines, grey, fine to coarse grained sand, trace of fine grained sub-rounded gravel			**ALLUVIUM** 2.80: Nil Odour
				ES 3.25m								
PT				ES 3.50m						W		3.30: PP = 180kPa
				ES 3.75m	86.0							
				ES 4.00m		4.0		CH				
				ES 4.25m								
				ES 4.50m					...inclusion of gravel, deposit of fine to medium grained sub-rounded			4.50: Gravel observed as pale grey quartz
				ES 4.75m	85.0							
				ES		5.0			5.00m			
					84.0				Hole Terminated at 5.00 m			5.00: LIMIT OF INVESTIGATION
						6.0						
					83.0							
						7.0						
					82.0							
						8.0						
					81.0							
						9.0						
					80.0							
						10.0						

METHOD
- HA Hand auger
- AS Auger screwing
- ADV Auger drilling with V bit
- ADT Auger drilling with TC bit
- HF Hollow flight auger
- WB Wash-bore drilling
- RR Rock roller
- SD Sonic drilling
- NDD Non destructive drilling
- PT Continuous push tub
- HAND Hand methods

PENETRATION
VE E F H VH
No Resistance
Very Hard / Refusal

WATER
- dd/mm/yy Level on Date shown
- Drilling water level
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- B Bulk Disturbed Sample
- D Disturbed Sample
- U Undisturbed Sample
- ES Environmental Sample
- W Water Sample
- HP Hand Penetrometer (kPa)
- SPT Standard Penetration Test
- N Result of SPT (*=sample taken)
- R Hammer Bouncing / Refusal
- U50 Undisturbed Sample (50mm dia)
- U75 Undisturbed Sample (75mm dia)
- VS Vane Shear; peak/remouded(kPa)
- PT Push Tube
- MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D Dry
- M Moist
- W Wet
- PL Plastic limit
- LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
Fb	- Friable
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : SS03
PROJECT NUMBER : 30031970
SHEET : 1 OF 1
FINAL DEPTH : 4.2 m

CLIENT : SEQ WATER
PROJECT : LAKE MACDONALD
LOCATION :

POSITION : E: 493242.0, N: 7082068.0 (MGA94 Zone 56) SURFACE ELEVATION : 95.50 (AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : GEOPROBE 7720 DT MOUNTING : TRACK CONTRACTOR : NUMAC HOLE DIA : 100 mm

DATE STARTED : 05/09/2018 DATE COMPLETED : 05/09/2018 DATE LOGGED : 05/09/2018 LOGGED BY : AS CHECKED BY : OP

Drilling & Casing	Drilling Fluid	Ground Water Levels	Samples & Field Tests	Depth (m)	Classification Symbol	Material Description	Moisture Condition	Structure & Other Observations
HA (0.0–1.5 m)	No Fluid		ES 0.25m	0.00–0.10	SM	**Silty SAND:** fine to coarse grained, brown, low plasticity fines, trace of organics as fine roots <5mm Ø	M	TOPSOIL
			ES 0.50m	0.10–0.40	SC	**Clayey SAND:** fine to coarse grained, red/brown, medium to high plasticity fines	M	FILL
			ES 0.75m	0.40–0.90	SC	**Clayey SAND:** fine to coarse grained, brown, medium plasticity fines, trace of fine to medium grained angular gravel	M	
			ES 1.00m, ES 1.25m, ES 1.50m	0.90–1.70	CH	**Sandy CLAY:** high plasticity fines, orange/brown, fine to coarse grained sand	M	
ADT (1.5–4.2 m)		05/09/18 (≈1.95 m)	ES 1.75m, ES 2.00m, ES 2.25m	1.70–2.30	SC	**Clayey SAND:** fine to coarse grained, orange/brown, medium to high plasticity fines, trace of fine to medium grained angular gravel	M (to 2.0 m) / W	
			ES 2.50m, ES 2.75m, ES 3.00m, ES 3.25m, ES 3.50m, ES 3.75m, ES	2.30–4.20	CH	**Sandy CLAY:** high plasticity fines, orange/brown, fine to coarse grained sand, trace of fine to medium grained angular/sub-angular gravel	W	
				4.20		Hole Terminated at 4.20 m		4.20: T/C AUGER BIT REFUSAL

Elevation scale: 95.0, 94.0, 93.0, 92.0, 91.0, 90.0, 89.0, 88.0, 87.0, 86.0. Depth scale: 0.0–10.0 m.

METHOD
HA Hand auger
AS Auger screwing
ADV Auger drilling with V bit
ADT Auger drilling with TC bit
HF Hollow flight auger
WB Wash-bore drilling
RR Rock roller
SD Sonic drilling
NDD Non destructive drilling
PT Continuous push tub
HAND Hand methods

PENETRATION
VE E F H VH
No Resistance
Very Hard / Refusal

WATER
dd/mm/yy Level on Date shown
Drilling water level
water inflow
water outflow

SAMPLES & FIELD TESTS
B Bulk Disturbed Sample
D Disturbed Sample
U Undisturbed Sample
ES Environmental Sample
W Water Sample
HP Hand Penetrometer (kPa)
SPT Standard Penetration Test
N Result of SPT (*=sample taken)
R Hammer Bouncing / Refusal
U50 Undisturbed Sample (50mm dia)
U75 Undisturbed Sample (75mm dia)
VS Vane Shear; peak/remouded(kPa)
PT Push Tube
MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D Dry
M Moist
W Wet
PL Plastic limit
LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

Appendix E Test Results

eurofins | mgt

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Certificate of Analysis

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South Brisbane
QLD 4101

NATA Accredited
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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Andy Snedden**

Report **616416-S-V3**
Project name LAKE MACDONALD
Project ID 30031970 A4.13.2
Received Date Sep 07, 2018

Client Sample ID			**SS01_0.0-0.25**	**SS01_0.25-0.5**	**SS01_0.5-0.75**	**SS01_0.75-1.0**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**B18-Se08875**	**B18-Se08876**	**B18-Se08877**	**B18-Se08878**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.2	6.1	6.4	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.0	4.8	4.9	5.2
Reaction Ratings*[S05]		comment	4.0	3.0	1.0	1.0

Client Sample ID			**SS01_1.0-1.25**	**SS01_1.25-1.5**	**SS01_1.5-1.75**	**SS01_1.75-2.0**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**B18-Se08879**	**B18-Se08880**	**B18-Se08881**	**B18-Se08882**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.4	5.5	5.5	5.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.6	4.6	4.3	4.0
Reaction Ratings*[S05]		comment	1.0	1.0	1.0	4.0

Client Sample ID			**SS01_2.0-2.25**	**SS01_2.25-2.5**	**SS01_2.5-2.75**	**SS01_2.75-3.0**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**B18-Se08883**	**B18-Se08884**	**B18-Se08885**	**B18-Se08886**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.6	5.6	5.2	6.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.0	3.6	3.8	3.5
Reaction Ratings*[S05]		comment	4.0	1.0	1.0	1.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	5.2	-	5.4	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	16	-	10	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	0.03	-	< 0.02	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-

Client Sample ID			SS01_2.0-2.25	SS01_2.25-2.5	SS01_2.5-2.75	SS01_2.75-3.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08883	B18-Se08884	B18-Se08885	B18-Se08886
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Chromium Suite (SKCl)						
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	n/a	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.03	-	< 0.02	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	16	-	10	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	1.2	-	< 1	-
<2mm Fraction	0.005	g	46	-	19	-
>2mm Fraction	0.005	g	< 0.005	-	< 0.005	-
Analysed Material	0.1	%	100	-	100	-
Extraneous Material	0.1	%	< 0.1	-	< 0.1	-
% Moisture	1	%	16	-	14	-

Client Sample ID			SS01_3.0-3.25	SS01_3.25-3.5	SS01_3.5-3.75	SS01_3.75-4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08887	B18-Se08888	B18-Se08889	B18-Se08890
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.4	6.4	6.2	6.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.2	4.6	4.7	4.8
Reaction Ratings*[S05]		comment	1.0	1.0	1.0	2.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	6.5	-	6.5	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	-	< 2	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	-	< 0.02	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	0.06	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	11	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	0.02	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	-	< 0.02	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	-	< 10	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	-	< 1	-
<2mm Fraction	0.005	g	63	-	61	-
>2mm Fraction	0.005	g	0.20	-	< 0.005	-
Analysed Material	0.1	%	100	-	100	-
Extraneous Material	0.1	%	0.3	-	< 0.1	-

Client Sample ID			SS01_3.0-3.25	SS01_3.25-3.5	SS01_3.5-3.75	SS01_3.75-4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08887	B18-Se08888	B18-Se08889	B18-Se08890
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
% Moisture	1	%	16	-	15	-

Client Sample ID			SS01_4.0-4.25	SS01_4.25-4.5	SS01_4.5-4.75	SS01_4.75-5.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08891	B18-Se08892	B18-Se08893	B18-Se08894
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	6.3	6.2	6.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.6	5.2	5.1	4.9
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	2.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	6.5	-	6.4	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	-	< 2	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	-	< 0.02	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	0.07	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	14	-	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	0.02	-	n/a	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	-	< 0.02	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	-	< 10	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	-	< 1	-
<2mm Fraction	0.005	g	48	-	60	-
>2mm Fraction	0.005	g	< 0.005	-	0.18	-
Analysed Material	0.1	%	100	-	100	-
Extraneous Material	0.1	%	< 0.1	-	0.3	-
% Moisture	1	%	17	-	16	-

Client Sample ID			SS01_5.0-5.25	SS01_5.25-5.5	SS01_5.5-5.75	SS01_5.75-6.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08895	B18-Se08896	B18-Se08897	B18-Se08898
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	6.6	6.2	6.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.0	4.9	4.5	4.5
Reaction Ratings*[S05]		comment	4.0	4.0	2.0	2.0

Client Sample ID			SS01_5.0-5.25	SS01_5.25-5.5	SS01_5.5-5.75	SS01_5.75-6.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08895	B18-Se08896	B18-Se08897	B18-Se08898
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	5.6	-	6.4	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	4.5	-	< 2	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	-	< 0.02	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	n/a	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	-	< 0.02	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	-	< 10	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	-	< 1	-
<2mm Fraction	0.005	g	66	-	50	-
>2mm Fraction	0.005	g	0.25	-	< 0.005	-
Analysed Material	0.1	%	100	-	100	-
Extraneous Material	0.1	%	0.4	-	< 0.1	-
% Moisture	1	%	14	-	15	-

Client Sample ID			SS01_6.0-6.25	SS01_6.25-6.5	SS01_6.5-6.75	SS01_6.75-7.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08899	B18-Se08900	B18-Se08901	B18-Se08902
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.0	6.4	5.7	6.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.6	4.3	3.9	5.1
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	4.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	6.2	-	6.1	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	-	2.1	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	-	< 0.02	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	n/a	-

Client Sample ID			SS01_6.0-6.25	SS01_6.25-6.5	SS01_6.5-6.75	SS01_6.75-7.0
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**B18-Se08899**	**B18-Se08900**	**B18-Se08901**	**B18-Se08902**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit				
Chromium Suite (SKCl)						
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	n/a	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	-	< 0.02	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	-	< 10	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	-	< 1	-
<2mm Fraction	0.005	g	54	-	41	-
>2mm Fraction	0.005	g	< 0.005	-	2.5	-
Analysed Material	0.1	%	100	-	94	-
Extraneous Material	0.1	%	< 0.1	-	5.7	-
% Moisture	1	%	17	-	14	-

Client Sample ID			SS01_7.0-7.25	SS01_7.25-7.5	SS01_7.5-7.75	SS01_7.75-8.0
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**B18-Se08903**	**B18-Se08904**	**B18-Se08905**	**B18-Se08906**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.4	6.2	5.4	5.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.0	4.7	4.6	4.7
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	4.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	5.9	-	4.8	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	3.5	-	23	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	-	0.04	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	n/a	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	-	0.04	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	-	23	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	-	1.7	-
<2mm Fraction	0.005	g	36	-	49	-
>2mm Fraction	0.005	g	37	-	0.73	-
Analysed Material	0.1	%	49	-	99	-
Extraneous Material	0.1	%	51	-	1.5	-
% Moisture	1	%	11	-	14	-

Client Sample ID			SS01_8.0-8.25	SS01_8.25-8.5	SS01_8.5-8.75	SS01_8.75-9.0
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**B18-Se08907**	**B18-Se08908**	**B18-Se08909**	**B18-Se08910**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.6	5.4	6.4	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.4	4.4	4.4	4.8
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	4.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	4.9	-	-	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	21	-	-	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	0.03	-	-	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	-	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	-	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	-	-
HCl Extractable Sulfur	0.02	% S	n/a	-	-	-
Net Acid soluble sulfur	0.02	% S	n/a	-	-	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	-	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	-	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	-	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	-	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	-	-
ANC Fineness Factor		factor	1.5	-	-	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.03	-	-	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	21	-	-	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	1.5	-	-	-
<2mm Fraction	0.005	g	58	-	-	-
>2mm Fraction	0.005	g	5.0	-	-	-
Analysed Material	0.1	%	92	-	-	-
Extraneous Material	0.1	%	8.0	-	-	-
% Moisture	1	%	14	-	-	-

Client Sample ID			SS01_9.0-9.25	SS02_0.0-0.25	SS02_0.25-0.5	SS02_0.5-0.75
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**B18-Se08911**	**B18-Se08912**	**B18-Se08913**	**B18-Se08914**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	5.9	5.5	5.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.2	3.1	3.4	4.2
Reaction Ratings*[S05]		comment	4.0	3.0	3.0	3.0

Client Sample ID			SS02_0.75-1.0	SS02_1.0-1.25	SS02_1.25-1.5	SS02_1.5-1.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08915	B18-Se08916	B18-Se08917	B18-Se08918
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.5	5.5	5.5	5.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.5	5.4	5.5	5.3
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	4.0

Client Sample ID			SS02_1.75-2.0	SS02_2.0-2.25	SS02_2.25-2.5	SS02_2.5-2.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08919	B18-Se08920	B18-Se08921	B18-Se08922
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.5	5.7	5.2	5.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.8	5.3	5.6	5.6
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	4.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	-	-	5.0	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	-	-	19	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	-	-	0.03	-
Chromium Reducible Sulfur[S04]	0.005	% S	-	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	-	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	-	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	-	-	n/a	-
Net Acid soluble sulfur	0.02	% S	-	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	-	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	-	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	-	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	-	-	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	-	-	n/a	-
ANC Fineness Factor		factor	-	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	-	-	0.03	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	-	-	19	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	-	-	1.5	-
<2mm Fraction	0.005	g	-	-	43	-
>2mm Fraction	0.005	g	-	-	< 0.005	-
Analysed Material	0.1	%	-	-	100	-
Extraneous Material	0.1	%	-	-	< 0.1	-
% Moisture	1	%	-	-	18	-

Client Sample ID			SS02_2.75-3.0	SS02_3.0-3.25	SS02_3.25-3.5	SS02_3.5-3.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08923	B18-Se08924	B18-Se08925	B18-Se08926
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.2	5.5	5.7	5.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.4	5.4	5.3	5.0
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	4.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	5.0	-	4.9	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	18	-	22	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	0.03	-	0.04	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	n/a	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.03	-	0.04	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	18	-	22	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	1.4	-	1.6	-
<2mm Fraction	0.005	g	36	-	48	-
>2mm Fraction	0.005	g	< 0.005	-	< 0.005	-
Analysed Material	0.1	%	100	-	100	-
Extraneous Material	0.1	%	< 0.1	-	< 0.1	-
% Moisture	1	%	17	-	16	-

Client Sample ID			SS02_3.75-4.0	SS02_4.0-4.25	SS02_4.25-4.5	SS02_4.5-4.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08927	B18-Se08928	B18-Se08929	B18-Se08930
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.2	5.3	5.3	5.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.2	4.9	4.7	4.3
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	4.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	5.0	-	4.9	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	17	-	25	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	0.03	-	0.04	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	< 3	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	< 0.02	-
HCl Extractable Sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	-	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	n/a	-

Client Sample ID			SS02_3.75-4.0	SS02_4.0-4.25	SS02_4.25-4.5	SS02_4.5-4.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08927	B18-Se08928	B18-Se08929	B18-Se08930
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Chromium Suite (SKCl)						
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	n/a	-
ANC Fineness Factor		factor	1.5	-	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.03	-	0.04	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	17	-	25	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	1.3	-	1.9	-
<2mm Fraction	0.005	g	43	-	43	-
>2mm Fraction	0.005	g	< 0.005	-	< 0.005	-
Analysed Material	0.1	%	100	-	100	-
Extraneous Material	0.1	%	< 0.1	-	< 0.1	-
% Moisture	1	%	15	-	15	-

Client Sample ID			SS02_4.75-5.0	SS03_0.0-0.25	SS03_0.25-0.5	SS03_0.5-0.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08931	B18-Se08932	B18-Se08933	B18-Se08934
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.4	5.8	5.8	5.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.0	3.6	3.2	3.8
Reaction Ratings*[S05]		comment	4.0	3.0	4.0	4.0
Chromium Suite (SKCl)						
pH-KCL	0.1	pH Units	5.0	-	-	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	18	-	-	-
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	0.03	-	-	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	-	-	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	-	-	-
Sulfur - KCl Extractable	0.02	% S	< 0.02	-	-	-
HCl Extractable Sulfur	0.02	% S	n/a	-	-	-
Net Acid soluble sulfur	0.02	% S	n/a	-	-	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	-	-	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	-	-	-
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	n/a	-	-	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	-	-	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	-	-	-
ANC Fineness Factor		factor	1.5	-	-	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.03	-	-	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	18	-	-	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	1.4	-	-	-
<2mm Fraction	0.005	g	39	-	-	-
>2mm Fraction	0.005	g	< 0.005	-	-	-
Analysed Material	0.1	%	100	-	-	-
Extraneous Material	0.1	%	< 0.1	-	-	-

Client Sample ID			SS02_4.75-5.0	SS03_0.0-0.25	SS03_0.25-0.5	SS03_0.5-0.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08931	B18-Se08932	B18-Se08933	B18-Se08934
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
% Moisture	1	%	13	-	-	-

Client Sample ID			SS03_0.75-1.0	SS03_1.0-1.25	SS03_1.25-1.5	SS03_1.5-1.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08935	B18-Se08936	B18-Se08937	B18-Se08938
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.4	5.6	5.6	5.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.8	3.5	4.2	4.4
Reaction Ratings*[S05]		comment	3.0	4.0	1.0	1.0

Client Sample ID			SS03_1.75-2.0	SS03_2.0-2.25	SS03_2.25-2.5	SS03_2.5-2.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08939	B18-Se08940	B18-Se08941	B18-Se08942
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.8	5.9	5.4	5.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.7	4.9	4.0	4.8
Reaction Ratings*[S05]		comment	1.0	1.0	4.0	1.0

Client Sample ID			SS03_2.75-3.0	SS03_3.0-3.25	SS03_3.25-3.5	SS03_3.5-3.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			B18-Se08943	B18-Se08944	B18-Se08945	B18-Se08946
Date Sampled			Sep 05, 2018	Sep 05, 2018	Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.8	5.4	5.8	5.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.6	4.8	4.7	4.7
Reaction Ratings*[S05]		comment	1.0	1.0	2.0	2.0

Client Sample ID			SS03_3.75-4.0	SS03_4.0-4.2
Sample Matrix			Soil	Soil
Eurofins | mgt Sample No.			B18-Se08947	B18-Se08948
Date Sampled			Sep 05, 2018	Sep 05, 2018
Test/Reference	LOR	Unit		
Acid Sulfate Soils Field pH Test				
pH-F (Field pH test)*	0.1	pH Units	5.6	5.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.7	4.7
Reaction Ratings*[S05]		comment	1.0	1.0

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acid Sulfate Soils Field pH Test	Brisbane	Sep 10, 2018	7 Days
- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			
Chromium Suite (SKCl)	Brisbane	Sep 10, 2018	6 Week
- Method: LTM-GEN-7070			
% Moisture	Brisbane	Sep 07, 2018	14 Day
- Method: LTM-GEN-7080 Moisture			

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ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name: SMEC Australia Pty Ltd (QLD)
Address: Level 1, 154 Melbourne St
South Brisbane
QLD 4101

Project Name: LAKE MACDONALD
Project ID: 30031970 A4.13.2

Order No.:
Report #: 616416
Phone: 07 3029 6643
Fax:

Received: Sep 7, 2018 12:15 PM
Due: Sep 14, 2018
Priority: 5 Day
Contact Name: Andy Snedden

Eurofins | mgt Analytical Services Manager : Ryan Gilbert

Sample Detail						Alkalinity (speciated)	Acid Sulfate Soils Field pH Test	Eurofins | mgt Suite B15	Eurofins | mgt Suite B11	ASS Groundwater Quality Suite - WA Department of Environment and	NEPM 2013 Metals : Metals M13	Moisture Set	Eurofins | mgt Suite B4	Chromium Suite (SKCl)	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	DH4	Sep 05, 2018		Water	B18-Se08873	X		X	X	X	X		X		X
2	BH203	Sep 05, 2018		Water	B18-Se08874	X		X	X	X	X		X		X
3	SS01_0.0-0.25	Sep 05, 2018		Soil	B18-Se08875		X								
4	SS01_0.25-0.5	Sep 05, 2018		Soil	B18-Se08876		X								
5	SS01_0.5-0.75	Sep 05, 2018		Soil	B18-Se08877		X								
6	SS01_0.75-1.0	Sep 05, 2018		Soil	B18-Se08878		X								
7	SS01_1.0-1.25	Sep 05, 2018		Soil	B18-Se08879		X								
8	SS01_1.25-1.5	Sep 05, 2018		Soil	B18-Se08880		X								
9	SS01_1.5-1.75	Sep 05, 2018		Soil	B18-Se08881		X								

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ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
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Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
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Received: Sep 7, 2018 12:15 PM
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Contact Name: Andy Snedden

Eurofins | mgt Analytical Services Manager : Ryan Gilbert

Sample Detail						Alkalinity (speciated)	Acid Sulfate Soils Field pH Test	Eurofins | mgt Suite B15	Eurofins | mgt Suite B11	ASS Groundwater Quality Suite - WA Department of Environment and	NEPM 2013 Metals : Metals M13	Moisture Set	Eurofins | mgt Suite B4	Chromium Suite (SKCl)	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
10	SS01_1.75-2.0	Sep 05, 2018		Soil	B18-Se08882		X								
11	SS01_2.0-2.25	Sep 05, 2018		Soil	B18-Se08883		X					X		X	
12	SS01_2.25-2.5	Sep 05, 2018		Soil	B18-Se08884		X								
13	SS01_2.5-2.75	Sep 05, 2018		Soil	B18-Se08885		X					X		X	
14	SS01_2.75-3.0	Sep 05, 2018		Soil	B18-Se08886		X								
15	SS01_3.0-3.25	Sep 05, 2018		Soil	B18-Se08887		X					X		X	
16	SS01_3.25-3.5	Sep 05, 2018		Soil	B18-Se08888		X								
17	SS01_3.5-3.75	Sep 05, 2018		Soil	B18-Se08889		X					X		X	
18	SS01_3.75-4.0	Sep 05, 2018		Soil	B18-Se08890		X								
19	SS01_4.0-4.25	Sep 05, 2018		Soil	B18-Se08891		X					X		X	
20	SS01_4.25-4.5	Sep 05, 2018		Soil	B18-Se08892		X								
21	SS01_4.5-4.75	Sep 05, 2018		Soil	B18-Se08893		X					X		X	

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ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
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Oakleigh VIC 3166
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Site # 1254 & 14271

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Phone : +61 8 9251 9600
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Company Name: SMEC Australia Pty Ltd (QLD)
Address: Level 1, 154 Melbourne St
South Brisbane
QLD 4101

Project Name: LAKE MACDONALD
Project ID: 30031970 A4.13.2

Order No.:
Report #: 616416
Phone: 07 3029 6643
Fax:

Received: Sep 7, 2018 12:15 PM
Due: Sep 14, 2018
Priority: 5 Day
Contact Name: Andy Snedden

Eurofins | mgt Analytical Services Manager : Ryan Gilbert

Sample Detail						Alkalinity (speciated)	Acid Sulfate Soils Field pH Test	Eurofins | mgt Suite B15	Eurofins | mgt Suite B11	ASS Groundwater Quality Suite - WA Department of Environment and	NEPM 2013 Metals : Metals M13	Moisture Set	Eurofins | mgt Suite B4	Chromium Suite (SKCl)	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
22	SS01_4.75-5.0	Sep 05, 2018		Soil	B18-Se08894		X								
23	SS01_5.0-5.25	Sep 05, 2018		Soil	B18-Se08895		X					X		X	
24	SS01_5.25-5.5	Sep 05, 2018		Soil	B18-Se08896		X								
25	SS01_5.5-5.75	Sep 05, 2018		Soil	B18-Se08897		X					X		X	
26	SS01_5.75-6.0	Sep 05, 2018		Soil	B18-Se08898		X								
27	SS01_6.0-6.25	Sep 05, 2018		Soil	B18-Se08899		X					X		X	
28	SS01_6.25-6.5	Sep 05, 2018		Soil	B18-Se08900		X								
29	SS01_6.5-6.75	Sep 05, 2018		Soil	B18-Se08901		X					X		X	
30	SS01_6.75-7.0	Sep 05, 2018		Soil	B18-Se08902		X								
31	SS01_7.0-7.25	Sep 05, 2018		Soil	B18-Se08903		X					X		X	
32	SS01_7.25-7.5	Sep 05, 2018		Soil	B18-Se08904		X								
33	SS01_7.5-7.75	Sep 05, 2018		Soil	B18-Se08905		X					X		X	

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ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
34	SS01_7.75-8.0	Sep 05, 2018		Soil	B18-Se08906		X								
35	SS01_8.0-8.25	Sep 05, 2018		Soil	B18-Se08907		X					X		X	
36	SS01_8.25-8.5	Sep 05, 2018		Soil	B18-Se08908		X								
37	SS01_8.5-8.75	Sep 05, 2018		Soil	B18-Se08909		X								
38	SS01_8.75-9.0	Sep 05, 2018		Soil	B18-Se08910		X								
39	SS01_9.0-9.25	Sep 05, 2018		Soil	B18-Se08911		X								
40	SS02_0.0-0.25	Sep 05, 2018		Soil	B18-Se08912		X								
41	SS02_0.25-0.5	Sep 05, 2018		Soil	B18-Se08913		X								
42	SS02_0.5-0.75	Sep 05, 2018		Soil	B18-Se08914		X								
43	SS02_0.75-1.0	Sep 05, 2018		Soil	B18-Se08915		X								
44	SS02_1.0-1.25	Sep 05, 2018		Soil	B18-Se08916		X								
45	SS02_1.25-1.5	Sep 05, 2018		Soil	B18-Se08917		X								

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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
46	SS02_1.5-1.75	Sep 05, 2018		Soil	B18-Se08918		X								
47	SS02_1.75-2.0	Sep 05, 2018		Soil	B18-Se08919		X								
48	SS02_2.0-2.25	Sep 05, 2018		Soil	B18-Se08920		X								
49	SS02_2.25-2.5	Sep 05, 2018		Soil	B18-Se08921		X					X		X	
50	SS02_2.5-2.75	Sep 05, 2018		Soil	B18-Se08922		X								
51	SS02_2.75-3.0	Sep 05, 2018		Soil	B18-Se08923		X					X		X	
52	SS02_3.0-3.25	Sep 05, 2018		Soil	B18-Se08924		X								
53	SS02_3.25-3.5	Sep 05, 2018		Soil	B18-Se08925		X					X		X	
54	SS02_3.5-3.75	Sep 05, 2018		Soil	B18-Se08926		X								
55	SS02_3.75-4.0	Sep 05, 2018		Soil	B18-Se08927		X					X		X	
56	SS02_4.0-4.25	Sep 05, 2018		Soil	B18-Se08928		X								
57	SS02_4.25-4.5	Sep 05, 2018		Soil	B18-Se08929		X					X		X	

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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
58	SS02_4.5-4.75	Sep 05, 2018		Soil	B18-Se08930		X								
59	SS02_4.75-5.0	Sep 05, 2018		Soil	B18-Se08931		X					X		X	
60	SS03_0.0-0.25	Sep 05, 2018		Soil	B18-Se08932		X								
61	SS03_0.25-0.5	Sep 05, 2018		Soil	B18-Se08933		X								
62	SS03_0.5-0.75	Sep 05, 2018		Soil	B18-Se08934		X								
63	SS03_0.75-1.0	Sep 05, 2018		Soil	B18-Se08935		X								
64	SS03_1.0-1.25	Sep 05, 2018		Soil	B18-Se08936		X								
65	SS03_1.25-1.5	Sep 05, 2018		Soil	B18-Se08937		X								
66	SS03_1.5-1.75	Sep 05, 2018		Soil	B18-Se08938		X								
67	SS03_1.75-2.0	Sep 05, 2018		Soil	B18-Se08939		X								
68	SS03_2.0-2.25	Sep 05, 2018		Soil	B18-Se08940		X								
69	SS03_2.25-2.5	Sep 05, 2018		Soil	B18-Se08941		X								

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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
70	SS03_2.5-2.75	Sep 05, 2018		Soil	B18-Se08942		X								
71	SS03_2.75-3.0	Sep 05, 2018		Soil	B18-Se08943		X								
72	SS03_3.0-3.25	Sep 05, 2018		Soil	B18-Se08944		X								
73	SS03_3.25-3.5	Sep 05, 2018		Soil	B18-Se08945		X								
74	SS03_3.5-3.75	Sep 05, 2018		Soil	B18-Se08946		X								
75	SS03_3.75-4.0	Sep 05, 2018		Soil	B18-Se08947		X								
76	SS03_4.0-4.2	Sep 05, 2018		Soil	B18-Se08948		X								
Test Counts						2	74	2	2	2	2	19	2	19	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

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Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Chromium Suite (SKCl)									
Chromium Reducible Sulfur			%	96			70-130	Pass	
Acid Neutralising Capacity (ANCbt)			%	104			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B18-Se08875	CP	pH Units	6.2	6.2	pass	30%	Pass	
Reaction Ratings*	B18-Se08875	CP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
Chromium Suite (SKCl)				Result 1	Result 2	RPD			
pH-KCL	B18-Se08883	CP	pH Units	5.2	5.2	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	B18-Se08883	CP	mol H+/t	16	16	2.2	30%	Pass	
sulfidic - TAA equiv. S% pyrite	B18-Se08883	CP	% pyrite S	0.03	0.03	2.0	30%	Pass	
Chromium Reducible Sulfur	B18-Se08883	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	B18-Se08883	CP	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCl Extractable	B18-Se08883	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
HCl Extractable Sulfur	B18-Se08883	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	B18-Se08883	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	B18-Se08883	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	B18-Se08883	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	B18-Se08883	CP	%CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	B18-Se08883	CP	% S	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	B18-Se08883	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	B18-Se08883	CP	% S	0.03	0.03	n/a	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	B18-Se08883	CP	mol H+/t	16	16	n/a	30%	Pass	
CRS Suite - Liming Rate	B18-Se08883	CP	kg CaCO3/t	1.2	1.2	2.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	B18-Se08883	CP	%	16	17	4.0	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B18-Se08895	CP	pH Units	6.5	6.7	pass	30%	Pass	
Reaction Ratings*	B18-Se08895	CP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
Chromium Suite (SKCl)				Result 1	Result 2	RPD			
pH-KCL	B18-Se08903	CP	pH Units	5.9	5.9	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	B18-Se08903	CP	mol H+/t	3.5	3.4	4.7	30%	Pass	
sulfidic - TAA equiv. S% pyrite	B18-Se08903	CP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass	
Chromium Reducible Sulfur	B18-Se08903	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	B18-Se08903	CP	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCl Extractable	B18-Se08903	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
HCl Extractable Sulfur	B18-Se08903	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	B18-Se08903	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	B18-Se08903	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	

Duplicate									
Chromium Suite (SKCl)				Result 1	Result 2	RPD			
Net Acid soluble sulfur - equivalent S% pyrite	B18-Se08903	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	B18-Se08903	CP	%CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	B18-Se08903	CP	% S	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	B18-Se08903	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	B18-Se08903	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	B18-Se08903	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate	B18-Se08903	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	B18-Se08903	CP	%	11	12	9.0	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B18-Se08905	CP	pH Units	5.4	5.5	pass	30%	Pass	
Reaction Ratings*	B18-Se08905	CP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B18-Se08915	CP	pH Units	5.5	5.5	pass	30%	Pass	
Reaction Ratings*	B18-Se08915	CP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B18-Se08925	CP	pH Units	5.7	5.8	pass	30%	Pass	
Reaction Ratings*	B18-Se08925	CP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B18-Se08935	CP	pH Units	5.4	5.4	pass	30%	Pass	
Reaction Ratings*	B18-Se08935	CP	comment	3.0	3.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B18-Se08945	CP	pH Units	5.8	5.6	pass	30%	Pass	
Reaction Ratings*	B18-Se08945	CP	comment	2.0	2.0	pass	30%	Pass	

Comments

V3 - SAMPLE NAMES CHANGED AT THE ADVICE OF THE CLIENT.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m3'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised By

Ryan Gilbert	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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30 years Testing For Life 1987–2017
Celebrating 30 years Testing and Protecting Human Health

Certificate of Analysis

SMEC Australia Pty Ltd
Level 1, 154 Melbourne St
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QLD 4101

NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Andy Snedden**

Report **616416-W-V2**
Project name LAKE MACDONALD
Project ID 30031970 A4.13.2
Received Date Sep 07, 2018

Client Sample ID			**DH4**	**BH203**
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**B18-Se08873**	**B18-Se08874**
Date Sampled			**Sep 05, 2018**	**Sep 05, 2018**
Test/Reference	LOR	Unit		
Acidity (as CaCO3)	10	mg/L	130	120
Ammonia (as N)	0.01	mg/L	2.9	< 0.01
Chloride	1	mg/L	28	27
Conductivity (at 25°C)	1	uS/cm	140	86
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	0.83
Nitrate (as N)	0.02	mg/L	< 0.02	0.83
pH (at 25°C)	0.1	pH Units	6.4	5.4
Phosphate total (as P)	0.05	mg/L	< 0.05	0.69
Phosphorus filterable reactive (as P)	0.05	mg/L	< 0.05	< 0.05
Sulphate (as S)	5	mg/L	< 5	< 5
Sulphate (as SO4)	5	mg/L	< 5	< 5
Total Dissolved Solids	10	mg/L	160	59
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	4.5	0.7
Total Nitrogen (as N)	0.2	mg/L	4.5	1.5
Alkalinity (speciated)				
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	52	< 20
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20	< 20
Total Alkalinity (as CaCO3)	20	mg/L	52	< 20
Heavy Metals				
Aluminium	0.05	mg/L	13	46
Aluminium (filtered)	0.05	mg/L	< 0.05	< 0.05
Iron	0.05	mg/L	25	81
Iron (filtered)	0.05	mg/L	20	0.54
Alkali Metals				
Calcium	0.5	mg/L	7.6	0.8
Magnesium	0.5	mg/L	6.4	2.7
Potassium	0.5	mg/L	1.1	2.3
Sodium	0.5	mg/L	17	13

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
ASS Groundwater Quality Suite - WA Department of Environment and Conservation			
Acidity (as CaCO3)	Melbourne	Sep 10, 2018	14 Day
- Method: LTM-INO-4210 Acidity			
Ammonia (as N)	Melbourne	Sep 10, 2018	28 Day
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Chloride	Melbourne	Sep 10, 2018	28 Day
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Conductivity (at 25°C)	Melbourne	Sep 10, 2018	28 Day
- Method: LTM-INO-4030 Conductivity			
pH (at 25°C)	Melbourne	Sep 10, 2018	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Phosphate total (as P)	Melbourne	Sep 14, 2018	28 Day
- Method: APHA 4500-P E. Phosphorous			
Phosphorus filterable reactive (as P)	Melbourne	Sep 10, 2018	2 Day
- Method: APHA 4500-P Phosphate (filterable reactive)			
Sulphate (as S)	Melbourne	Sep 10, 2018	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Total Dissolved Solids	Melbourne	Sep 10, 2018	7 Day
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Alkalinity (speciated)	Melbourne	Sep 10, 2018	14 Day
- Method: APHA 2320 Alkalinity by Titration			
Heavy Metals	Melbourne	Sep 12, 2018	180 Day
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Acid Sulphate Metals : Metals M9 filtered	Melbourne	Sep 12, 2018	180 Day
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Alkali Metals	Melbourne	Sep 10, 2018	180 Day
- Method: LTM-MET-3010 Alkali Metals S Si and P by ICP-AES			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Sep 10, 2018	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Sep 10, 2018	7 Day
- Method: LTM-INO-4310 TKN in Waters & Soils by FIA			
Eurofins | mgt Suite B11			
Nitrate (as N)	Melbourne	Sep 10, 2018	28 Day
- Method: APHA 4500-NO3 Nitrate Nitrogen by FIA			
Sulphate (as SO4)	Melbourne	Sep 10, 2018	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			

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ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
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Kewdale WA 6105
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Company Name: SMEC Australia Pty Ltd (QLD)
Address: Level 1, 154 Melbourne St
South Brisbane
QLD 4101

Project Name: LAKE MACDONALD
Project ID: 30031970 A4.13.2

Order No.:
Report #: 616416
Phone: 07 3029 6643
Fax:

Received: Sep 7, 2018 12:15 PM
Due: Sep 14, 2018
Priority: 5 Day
Contact Name: Andy Snedden

Eurofins | mgt Analytical Services Manager : Ryan Gilbert

Sample Detail						Alkalinity (speciated)	Acid Sulfate Soils Field pH Test	Eurofins | mgt Suite B15	Eurofins | mgt Suite B11	ASS Groundwater Quality Suite - WA Department of Environment and	NEPM 2013 Metals : Metals M13	Moisture Set	Eurofins | mgt Suite B4	Chromium Suite (SKCl)	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	DH4	Sep 05, 2018		Water	B18-Se08873	X		X	X	X	X		X		X
2	BH203	Sep 05, 2018		Water	B18-Se08874	X		X	X	X	X		X		X
3	SS01_0.0-0.25	Sep 05, 2018		Soil	B18-Se08875		X								
4	SS01_0.25-0.5	Sep 05, 2018		Soil	B18-Se08876		X								
5	SS01_0.5-0.75	Sep 05, 2018		Soil	B18-Se08877		X								
6	SS01_0.75-1.0	Sep 05, 2018		Soil	B18-Se08878		X								
7	SS01_1.0-1.25	Sep 05, 2018		Soil	B18-Se08879		X								
8	SS01_1.25-1.5	Sep 05, 2018		Soil	B18-Se08880		X								
9	SS01_1.5-1.75	Sep 05, 2018		Soil	B18-Se08881		X								

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ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
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Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
10	SS01_1.75-2.0	Sep 05, 2018		Soil	B18-Se08882		X								
11	SS01_2.0-2.25	Sep 05, 2018		Soil	B18-Se08883		X					X		X	
12	SS01_2.25-2.5	Sep 05, 2018		Soil	B18-Se08884		X								
13	SS01_2.5-2.75	Sep 05, 2018		Soil	B18-Se08885		X					X		X	
14	SS01_2.75-3.0	Sep 05, 2018		Soil	B18-Se08886		X								
15	SS01_3.0-3.25	Sep 05, 2018		Soil	B18-Se08887		X					X		X	
16	SS01_3.25-3.5	Sep 05, 2018		Soil	B18-Se08888		X								
17	SS01_3.5-3.75	Sep 05, 2018		Soil	B18-Se08889		X					X		X	
18	SS01_3.75-4.0	Sep 05, 2018		Soil	B18-Se08890		X								
19	SS01_4.0-4.25	Sep 05, 2018		Soil	B18-Se08891		X					X		X	
20	SS01_4.25-4.5	Sep 05, 2018		Soil	B18-Se08892		X								
21	SS01_4.5-4.75	Sep 05, 2018		Soil	B18-Se08893		X					X		X	

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web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
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Unit F3, Building F
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Lane Cove West NSW 2066
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NATA # 1261 Site # 18217

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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
22	SS01_4.75-5.0	Sep 05, 2018		Soil	B18-Se08894		X								
23	SS01_5.0-5.25	Sep 05, 2018		Soil	B18-Se08895		X					X		X	
24	SS01_5.25-5.5	Sep 05, 2018		Soil	B18-Se08896		X								
25	SS01_5.5-5.75	Sep 05, 2018		Soil	B18-Se08897		X					X		X	
26	SS01_5.75-6.0	Sep 05, 2018		Soil	B18-Se08898		X								
27	SS01_6.0-6.25	Sep 05, 2018		Soil	B18-Se08899		X					X		X	
28	SS01_6.25-6.5	Sep 05, 2018		Soil	B18-Se08900		X								
29	SS01_6.5-6.75	Sep 05, 2018		Soil	B18-Se08901		X					X		X	
30	SS01_6.75-7.0	Sep 05, 2018		Soil	B18-Se08902		X								
31	SS01_7.0-7.25	Sep 05, 2018		Soil	B18-Se08903		X					X		X	
32	SS01_7.25-7.5	Sep 05, 2018		Soil	B18-Se08904		X								
33	SS01_7.5-7.75	Sep 05, 2018		Soil	B18-Se08905		X					X		X	

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ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
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NATA # 1261
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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
34	SS01_7.75-8.0	Sep 05, 2018		Soil	B18-Se08906		X								
35	SS01_8.0-8.25	Sep 05, 2018		Soil	B18-Se08907		X					X		X	
36	SS01_8.25-8.5	Sep 05, 2018		Soil	B18-Se08908		X								
37	SS01_8.5-8.75	Sep 05, 2018		Soil	B18-Se08909		X								
38	SS01_8.75-9.0	Sep 05, 2018		Soil	B18-Se08910		X								
39	SS01_9.0-9.25	Sep 05, 2018		Soil	B18-Se08911		X								
40	SS02_0.0-0.25	Sep 05, 2018		Soil	B18-Se08912		X								
41	SS02_0.25-0.5	Sep 05, 2018		Soil	B18-Se08913		X								
42	SS02_0.5-0.75	Sep 05, 2018		Soil	B18-Se08914		X								
43	SS02_0.75-1.0	Sep 05, 2018		Soil	B18-Se08915		X								
44	SS02_1.0-1.25	Sep 05, 2018		Soil	B18-Se08916		X								
45	SS02_1.25-1.5	Sep 05, 2018		Soil	B18-Se08917		X								

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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
46	SS02_1.5-1.75	Sep 05, 2018		Soil	B18-Se08918		X								
47	SS02_1.75-2.0	Sep 05, 2018		Soil	B18-Se08919		X								
48	SS02_2.0-2.25	Sep 05, 2018		Soil	B18-Se08920		X								
49	SS02_2.25-2.5	Sep 05, 2018		Soil	B18-Se08921		X					X		X	
50	SS02_2.5-2.75	Sep 05, 2018		Soil	B18-Se08922		X								
51	SS02_2.75-3.0	Sep 05, 2018		Soil	B18-Se08923		X					X		X	
52	SS02_3.0-3.25	Sep 05, 2018		Soil	B18-Se08924		X								
53	SS02_3.25-3.5	Sep 05, 2018		Soil	B18-Se08925		X					X		X	
54	SS02_3.5-3.75	Sep 05, 2018		Soil	B18-Se08926		X								
55	SS02_3.75-4.0	Sep 05, 2018		Soil	B18-Se08927		X					X		X	
56	SS02_4.0-4.25	Sep 05, 2018		Soil	B18-Se08928		X								
57	SS02_4.25-4.5	Sep 05, 2018		Soil	B18-Se08929		X					X		X	

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Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
58	SS02_4.5-4.75	Sep 05, 2018		Soil	B18-Se08930		X								
59	SS02_4.75-5.0	Sep 05, 2018		Soil	B18-Se08931		X					X		X	
60	SS03_0.0-0.25	Sep 05, 2018		Soil	B18-Se08932		X								
61	SS03_0.25-0.5	Sep 05, 2018		Soil	B18-Se08933		X								
62	SS03_0.5-0.75	Sep 05, 2018		Soil	B18-Se08934		X								
63	SS03_0.75-1.0	Sep 05, 2018		Soil	B18-Se08935		X								
64	SS03_1.0-1.25	Sep 05, 2018		Soil	B18-Se08936		X								
65	SS03_1.25-1.5	Sep 05, 2018		Soil	B18-Se08937		X								
66	SS03_1.5-1.75	Sep 05, 2018		Soil	B18-Se08938		X								
67	SS03_1.75-2.0	Sep 05, 2018		Soil	B18-Se08939		X								
68	SS03_2.0-2.25	Sep 05, 2018		Soil	B18-Se08940		X								
69	SS03_2.25-2.5	Sep 05, 2018		Soil	B18-Se08941		X								

eurofins | mgt

ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name: SMEC Australia Pty Ltd (QLD)
Address: Level 1, 154 Melbourne St
South Brisbane
QLD 4101

Project Name: LAKE MACDONALD
Project ID: 30031970 A4.13.2

Order No.:
Report #: 616416
Phone: 07 3029 6643
Fax:

Received: Sep 7, 2018 12:15 PM
Due: Sep 14, 2018
Priority: 5 Day
Contact Name: Andy Snedden

Eurofins | mgt Analytical Services Manager : Ryan Gilbert

Sample Detail						Alkalinity (speciated)	Acid Sulfate Soils Field pH Test	Eurofins | mgt Suite B15	Eurofins | mgt Suite B11	ASS Groundwater Quality Suite - WA Department of Environment and	NEPM 2013 Metals : Metals M13	Moisture Set	Eurofins | mgt Suite B4	Chromium Suite (SKCl)	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X	X	X	X		
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794							X				X	X		X	X
Perth Laboratory - NATA Site # 23736															
70	SS03_2.5-2.75	Sep 05, 2018		Soil	B18-Se08942		X								
71	SS03_2.75-3.0	Sep 05, 2018		Soil	B18-Se08943		X								
72	SS03_3.0-3.25	Sep 05, 2018		Soil	B18-Se08944		X								
73	SS03_3.25-3.5	Sep 05, 2018		Soil	B18-Se08945		X								
74	SS03_3.5-3.75	Sep 05, 2018		Soil	B18-Se08946		X								
75	SS03_3.75-4.0	Sep 05, 2018		Soil	B18-Se08947		X								
76	SS03_4.0-4.2	Sep 05, 2018		Soil	B18-Se08948		X								
Test Counts						2	74	2	2	2	2	19	2	19	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Acidity (as CaCO3)	mg/L	< 10			10	Pass	
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Phosphate total (as P)	mg/L	< 0.05			0.05	Pass	
Phosphorus filterable reactive (as P)	mg/L	< 0.05			0.05	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Sulphate (as SO4)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Method Blank							
Heavy Metals							
Aluminium	mg/L	< 0.05			0.05	Pass	
Aluminium (filtered)	mg/L	< 0.05			0.05	Pass	
Iron	mg/L	< 0.05			0.05	Pass	
Iron (filtered)	mg/L	< 0.05			0.05	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Ammonia (as N)	%	101			70-130	Pass	
Chloride	%	105			70-130	Pass	
Nitrate & Nitrite (as N)	%	102			70-130	Pass	
Nitrate (as N)	%	102			70-130	Pass	
Phosphate total (as P)	%	84			70-130	Pass	
Sulphate (as S)	%	129			70-130	Pass	
Sulphate (as SO4)	%	129			70-130	Pass	
Total Dissolved Solids	%	98			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	77			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Aluminium	%	103			80-120	Pass	
Aluminium (filtered)	%	90			80-120	Pass	
Iron	%	99			80-120	Pass	
Iron (filtered)	%	88			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	120			70-130	Pass	
Magnesium	%	114			70-130	Pass	
Potassium	%	97			70-130	Pass	
Sodium	%	101			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	M18-Se09769	NCP	%	89			70-130	Pass	
Chloride	B18-Se08426	NCP	%	108			70-130	Pass	
Nitrate & Nitrite (as N)	M18-Se09769	NCP	%	89			70-130	Pass	
Nitrate (as N)	M18-Se09769	NCP	%	89			70-130	Pass	
Phosphorus filterable reactive (as P)	M18-Se06492	NCP	%	114			70-130	Pass	
Sulphate (as S)	M18-Se09349	NCP	%	79			70-130	Pass	
Sulphate (as SO4)	M18-Se09349	NCP	%	79			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Total Alkalinity (as CaCO3)	M18-Se10505	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Aluminium	S18-Se09681	NCP	%	100			75-125	Pass	
Aluminium (filtered)	M18-Se12224	NCP	%	109			75-125	Pass	
Iron	S18-Se09681	NCP	%	93			75-125	Pass	
Iron (filtered)	M18-Se12224	NCP	%	107			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	S18-Se14470	NCP	%	127			70-130	Pass	
Magnesium	S18-Se14470	NCP	%	109			70-130	Pass	
Potassium	S18-Se14470	NCP	%	98			70-130	Pass	
Sodium	S18-Se14470	NCP	%	107			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M18-Se09769	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Chloride	B18-Se08431	NCP	mg/L	37	34	10	30%	Pass	
Conductivity (at 25°C)	M18-Se07584	NCP	uS/cm	980	970	<1	30%	Pass	
Nitrate & Nitrite (as N)	M18-Se09769	NCP	mg/L	2.1	2.1	<1	30%	Pass	
Nitrate (as N)	M18-Se09769	NCP	mg/L	2.1	2.1	<1	30%	Pass	
pH (at 25°C)	M18-Se07584	NCP	pH Units	6.7	6.6	pass	30%	Pass	
Phosphate total (as P)	S18-Se08773	NCP	mg/L	0.27	0.29	6.4	30%	Pass	
Phosphorus filterable reactive (as P)	M18-Se07927	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Sulphate (as S)	B18-Se08431	NCP	mg/L	71	56	1.0	30%	Pass	
Sulphate (as SO4)	B18-Se08431	NCP	mg/L	210	170	1.0	30%	Pass	
Total Dissolved Solids	M18-Se08698	NCP	mg/L	4800	4400	9.0	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M18-Se07584	NCP	mg/L	560	570	2.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M18-Se07584	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	M18-Se07584	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M18-Se07584	NCP	mg/L	560	570	2.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-Se09681	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Aluminium (filtered)	M18-Se12224	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Iron	S18-Se09681	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Iron (filtered)	M18-Se12224	NCP	mg/L	4.1	4.2	2.0	30%	Pass	

Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M18-Se09809	NCP	mg/L	19	20	2.0	30%	Pass	
Magnesium	M18-Se09809	NCP	mg/L	3.3	3.4	2.0	30%	Pass	
Potassium	M18-Se09809	NCP	mg/L	5.8	6.1	5.0	30%	Pass	
Sodium	M18-Se09809	NCP	mg/L	44	45	3.0	30%	Pass	

Comments

V2 - This report has been amended to provide results for the ASS 30031970 COC

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Ryan Gilbert	Analytical Services Manager
Chris Bennett	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Jonathon Angell	Senior Analyst-Organic (QLD)
Joseph Edouard	Senior Analyst-Organic (VIC)
Julie Kay	Senior Analyst-Inorganic (VIC)

Glenn Jackson
National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Groundwater Sampling Sheet

Well ID: BH203

SMEC

PROJECT NAME: LAKE MAC	PURGE DATE: 5/9/18
PROJECT NUMBER: 300319720	DATE SAMPLED: 5/9/18
CLIENT: SEQ WATER	DEPTH OF WELL (mBTOC): 13.1
WELL CASING DIAMETER (mm): 50mm	DEPTH TO PRODUCT (mBTOC):
CASING HEIGHT ABOVE GROUND LEVEL (m): REFER SURVEY	DEPTH TO GROUNDWATER (mBTOC): 2.92
ODOUR WHEN OPENING WELL: NIL PID WHEN OPENING WELL (ppm): -	DEPTH TO BE PURGED (m): 10.18
MONUMENT: ☑ GATIC COVERED: ☐ STAND PIPE: ☐	CHECKED BY:

GROUNDWATER PURGING INFORMATION

Purge until field parameters stabilise OR 3-5 casing volumes OR until "dry", whichever occurs first

1 casing volume = 0.5L/m for wells of 25mm diameter
1 casing volume = 2L/m for wells of 50mm diameter
1 casing volume = 8L/m for wells of 100mm diameter

Method/pump type: Bailer ☐ Submersible Pump ☑ Other: ☐

Recovery	Time (24 hr)	SWL (mBTOC)

Purge Start Time (2400 hr): 1618
Purge Stopp Time (2400 hr): 1629
Estimated Purge Volume: 21 Litres (3-5) Well Volumes
Actual Purge Volume: 28 Litres
Did well purge dry? No ☐ Yes ☑ if yes, when? Litres 25

FIELD RESULTS

	Time (24 hr)	pH	EC (S/cm)	Redox (mV)	DO ( )	Turbidity (NTU)	Temperature (°C)
After 1 purge	1629	5.42	0.08	190	68.9	>1000	20.9
After 2 purge (28)	1636	5.39	0.076	214	62.3	>1000	20.34
After 3 purge							
After 4 purge							
After 5 purge							
Acceptable Variation:	n/a	+/- 0.1	+/- 10%	+/- 10%	+/- 10%	+/- 10%	+/- 0.5

Are field results acceptable to allow sampling? Yes ☑ No ☐ If no, why?

SAMPLING DETAILS

Method: Bailer ☐ Submersible Pump ☑ Other:
Equipment: Dedicated/Disposable: ☐ Decontaminated: ☑ DECON 90
Hydrocarbon Sheen? Yes ☐ No ☑ INTERFACE PROBE
Water Colour: PALE BROWN Odour: NIL
Turbidity: Low ☐ Medium ☐ High ☐

LABORATORY ANALYSIS DETAILS

Sample ID:
Duplicate ID:
Triplicate ID:
TPH's ☑ PAH ☐ Metals ☐
BTEX ☑ VOCs ☐ SVOC's ☐
Other: REFER COC

GENERAL ENVIRONMENTAL CONDITIONS

Temp: Cold (<5°C) ☑ Cool (<15°C) ☐ Mild (<25°C) ☐ Warm (<35°C) ☐ Hot (<45°C) ☐
Air: Dry ☐ Medium ☐ Humid ☐ Rain ☑
Wind: Still ☐ Slight Breeze ☑ Windy ☐ Strong Wind ☐
Sky: Clear ☐ Scattered ☐ Cloudy ☑
Barometric Pressure:

Other comments:
NEWER MONUMENT COMPARED TO DH4
PAINTED YELLOW - EXTERNAL

Sampler Name: Andy Sneddon
Purger Name:

Notes:
mBTOC = Meters below top of casing

Groundwater Sampling Sheet

Well ID: DH4

SMEC

PROJECT NAME: LAKE MACDONALD	PURGE DATE: 5/9/18
PROJECT NUMBER: 30031970	DATE SAMPLED: 5/9/18
CLIENT: SEQ WATER	DEPTH OF WELL (mBTOC): 7.7m
WELL CASING DIAMETER (mm): 100mm	DEPTH TO PRODUCT (mBTOC):
CASING HEIGHT ABOVE GROUND LEVEL (m): PEKER SURVEY	DEPTH TO GROUNDWATER (mBTOC): 1.68m
ODOUR WHEN OPENING WELL: NIL PID WHEN OPENING WELL (ppm): —	DEPTH TO BE PURGED (m): 6.02
MONUMENT: ☐ GATIC COVERED: ☑ STAND PIPE: ☐	CHECKED BY:

GROUNDWATER PURGING INFORMATION

Purge until field parameters stabilise OR 3-5 casing volumes OR until "dry", whichever occurs first

1 casing volume = 0.5L/m for wells of 25mm diameter
1 casing volume = 2L/m for wells of 50mm diameter
1 casing volume = 8L/m for wells of 100mm diameter

Method/pump type: Bailer ☑ Submersible Pump ☐ Other: ☐

Recovery	Time (24 hr)	SWL (mBTOC)

Purge Start Time (2400 hr): 1348
Purge Stopp Time (2400 hr): 1406
Estimated Purge Volume: 49 Litres (3-5) Well Volumes
Actual Purge Volume: 40 Litres
Did well purge dry? No ☑ Yes ☐ if yes, when? Litres

FIELD RESULTS

	Time (24 hr)	pH	EC (S/cm)	Redox (mV)	DO ( )	Turbidity (NTU)	Temperature (°C)
After 1 purge	1406	6.53	0.220	22	60.4	960	21.8
After 2 purge (40)	1410	6.59	0.215	20	57.4	485	21.46
After 3 purge							
After 4 purge							
After 5 purge							
Acceptable Variation:	n/a	+/- 0.1	+/- 10%	+/- 10%	+/- 10%	+/- 10%	+/- 0.5

Are field results acceptable to allow sampling? Yes ☑ No ☐ If no, why?

SAMPLING DETAILS

Method: Bailer ☐ Submersible Pump ☑ Other:
Equipment: Dedicated/Disposable: ☐ Decontaminated: ☑
Hydrocarbon Sheen? Yes ☐ No ☑ INTERFACE PROBE
Water Colour: PALE GREY Odour: NIL
Turbidity: Low ☐ Medium ☑ High ☐

LABORATORY ANALYSIS DETAILS

Sample ID:
Duplicate ID:
Triplicate ID:

TPH's	☑	PAH	☐	Metals	☐
BTEX	☑	VOCs	☐	SVOC's	☐
Other:	/	PEKER COC			

GENERAL ENVIRONMENTAL CONDITIONS

Temp: Cold (<5°C) ☑ Cool (<15°C) ☐ Mild (<25°C) ☐ Warm (<35°C) ☐ Hot (<45°C) ☐
Air: Dry ☐ Medium ☐ Humid ☐ Rain ☑ PERIODS
Wind: Still ☐ Slight Breeze ☑ Windy ☐ Strong Wind ☐
Sky: Clear ☐ Scattered ☐ Cloudy ☑
Barometric Pressure:

Other comments:
OBSERVED AS STEEL CASING WITH EXTERNAL COLD GAL PAINT. - LOCKED CAP

Sampler Name: Andy Sneddon
Purger Name:

Notes:
mBTOC = Meters below top of casing

local people
global experience

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