Appendix B Land Resources Assessment

Ensham Life of Mine Extension Project – Zone 1

Land Resource Assessment

Ensham Resources Pty Ltd

Level 7/10 Eagle St, Brisbane City QLD 4000

Prepared by:

SLR Consulting Australia

SLR Project No.: 620.041251.00001

31 January 2025

Revision: 2.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
2.0	31 January 2025	Michelle Papenfus	Ben Brooks	Ben Brooks
1.0	27 October 2022	Asley Welch	Alex Koeman	Alex Koeman

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Ensham Resources Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

SLR Consulting Australia Pty Ltd (SLR) was commissioned by Ensham Resources Pty Ltd to complete a Land Resource Assessment (the Assessment) of the Ensham Life of Mine Extension Project – Zone 1 (the Project) at Ensham Mine (Ensham), which is the subject of an Environmental Authority (EA) amendment application. This report was subsequently updated to support a Regional Interests Development Approval for the Project.

Within the Project, a total of six Soil Map Units (SMU) were identified based on the dominant Australian Soil Classification (ASC) soil types. The dominant soil types within the Project are Eutrophic Brown Dermosols, followed by Crusty Brown Vertosols and a small area of Clastic Rudosols.

The land suitability assessment indicates the Project consists of:

- Cropping Class 4 (marginal land with severe limitations)
- Cropping Class 5 (unsuitable land)
- Grazing Class 2 (suitable land with minor limitations)
- Grazing Class 3 (suitable land with moderate limitations), and
- Grazing Class 5 (unsuitable land).

The main land suitability limitations of the soil in the Project were soil wetness (W) and soil water availability (M).

The agricultural land assessment indicates the Project consists of:

- Class A2 (a wide range of crops and/or horticultural crops)
- Class C2 (grazing native pastures with lower fertility soils than C1), and
- Class C3 (light grazing of native pastures and land suited to forestry).

Soil resources include an estimated topsoil volume of 4,764,300 m^3 and an estimated subsoil volume of 16,341,700 m^3. It is noted that limited (<0.2% of the Project) soil stripping is proposed as part of the Project.

Waste rock that may be produced from the Coal Handling Plant for the Project was characterised. Characterisation included the assessment of the waste rock through analysis of mine roof and floor materials, and interburden likely to be disturbed by mining. Results indicated:

- The waste rock is non-acid generating and has significant buffering capacity
- The geochemical abundance index results showed low to depleted (compared to median crustal concentrations) metal concentrations
- Some metals leachability results (in particular aluminium and vanadium) exceeded guideline values for aquatic ecosystem protection, which are not typically bioavailable at the measured pH of 8.9 to 9.8; the recorded values are likely to be the result of colloid transport through the 0.45 µm filter membrane used in the testing (Brookins; 1988, Meunier; 1994)
- The waste rock will be buried within existing open cut pits (located outside of the Project area in accordance with a Mining Waste Management Plan as per condition G2 of the EA) and laboratory results indicate any adverse impact from metals concentration and leachability is unlikely.

The estimated volume of waste rock from the proposed Project over the life of the mine is 143,100 m^3 in total, which is less than 0.4% of total approved waste rock volumes (36 million m^3) for the rehabilitation of open cut Pit C and Pit D. At less than 0.4% of total approved rock volume for Pit C and Pit D, it is not expected that this addition would impact the approved final landform outcomes in the Progressive Rehabilitation and Closure Plan. The rehabilitation of these opencut pits has been previously approved and does not form part of the scope of this Project.

Based upon this Land Resource Assessment report, existing EA conditions are considered adequate for the Project therefore no changes to the current EA conditions are proposed.

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Appendices

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) was commissioned by Ensham Resources Pty Ltd to complete a Land Resource Assessment (the Assessment) of the Ensham Life of Mine Extension Project – Zone 1 (the Project) at Ensham Mine (Ensham), which was the subject of an Environmental Authority (EA) Amendment application. The Project is located approximately 30 km north-east of Emerald.

The Project aims to extend the life of the existing underground operations at Ensham by up to eight years, with Run of mine (ROM) coal production planned to continue at a rate of approximately 4.5 million tonnes per annum (Mtpa). The Project encompasses an area of approximately 2,119 ha. The Project's regional setting and location are depicted in **Figure 1** and **Figure 2**, respectively.

This report was subsequently updated to support a Regional Interests Development Approval for the Project.

1.1 Purpose

The purpose of the Assessment is to assess potential impacts to the land resources within the Project area resulting from any surface disturbance discussed in Section 1.3. The Assessment included a soil survey and interpretation to summarise the following:

- Soil types
- Land suitability assessment
- Soil resources assessment, and
- Description of soil qualities (erosion risk, dispersion and salinity risks).

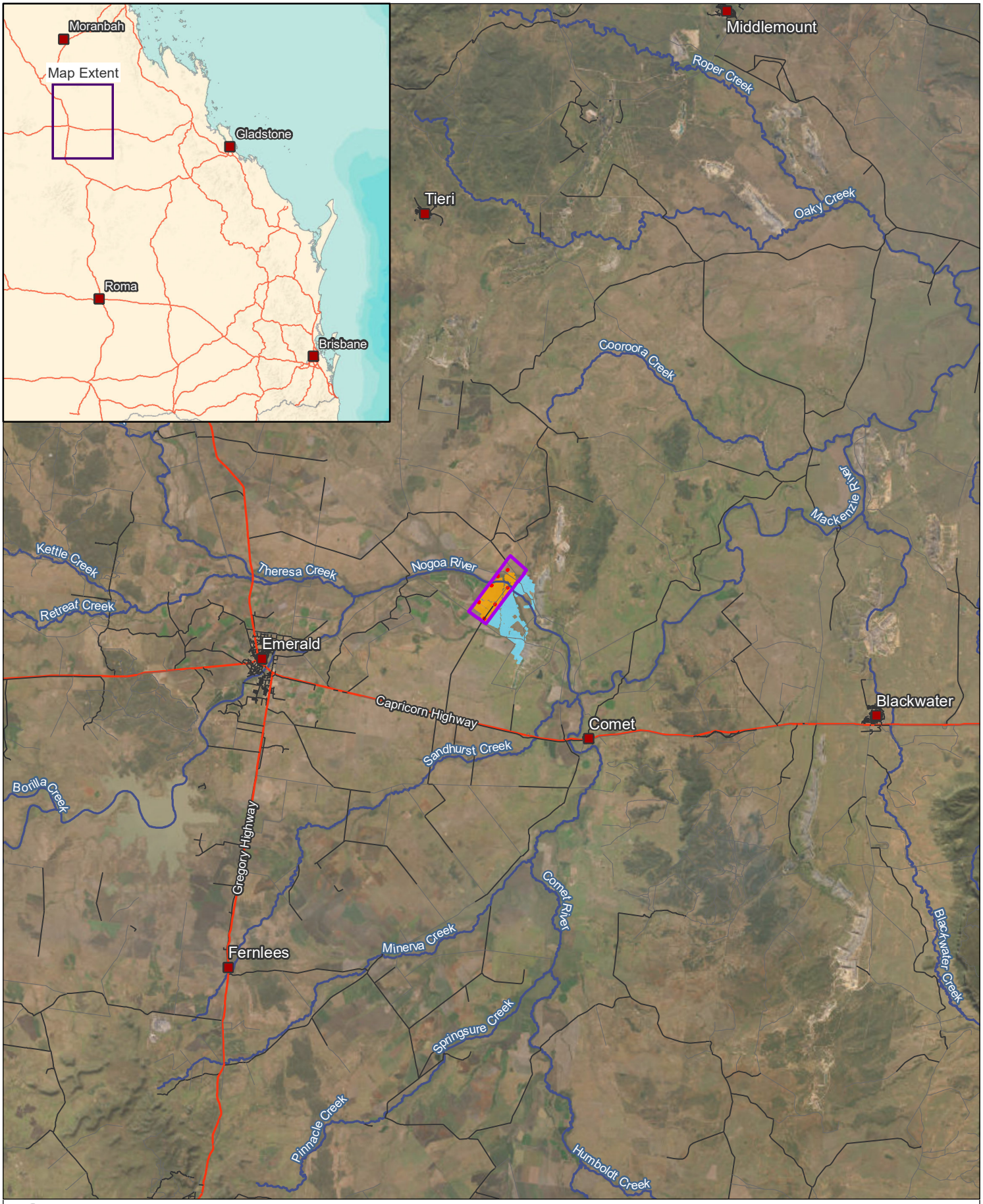
SLR were further commissioned by Ensham Resources Pty Ltd to perform a waste rock characterisation for the Project. Twelve waste rock samples from the Project were collected from twelve drill cores. The samples were tested for:

- Acid Mine Drainage (AMD) characteristics
- Geochemical Abundance Index (GAI) of metals within the solid waste, and
- Australian Standard Leaching Procedure (ASLP) leachability of metals from the waste rock.

Gordon Geotechniques Pty Ltd was commissioned by Ensham to undertake subsidence modelling to assess the potential impacts of the Project, which includes a peer review letter and prepare a subsidence management plan for the Ensham site (Gordon Geotechniques Pty Ltd, 2022). The original subsidence management plan was peer reviewed. The subsidence management plan has since been reviewed and updated as a requirement of Ensham's existing RPI Act approval RP122-002.

Results showed due to the nature of the bord and pillar mining method, low levels of subsidence, typically less than 40 mm, are predicted for the Project as a result of elastic compression of the strata. Real-Time Kinematic Global Positioning System monitoring at Ensham indicates subsidence levels of less than 10 mm above the approved underground mining operations. To provide context, the Australian Government Department of the Agriculture, Water and the Environment (DAWE) states that seasonal variation in surface levels can be up to 50 mm or more (Commonwealth of Australia, 2014; 2015) as a result of changes in moisture content. Monitoring data will continue to be collected to ensure any minor subsidence that is occurring is recorded and assessed. The Ensham Subsidence

Management Plan has been updated to include the monitoring of Zone 1 and includes mitigation measures if required. Any land use impacts associated with the Project will be managed in accordance with the individual land compensation agreements. As such, subsidence is not considered any further in this Assessment.



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Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:600,000 at A4
Project Number:	620.041251
Date:	17-Jan-2025
Drawn by:	JG

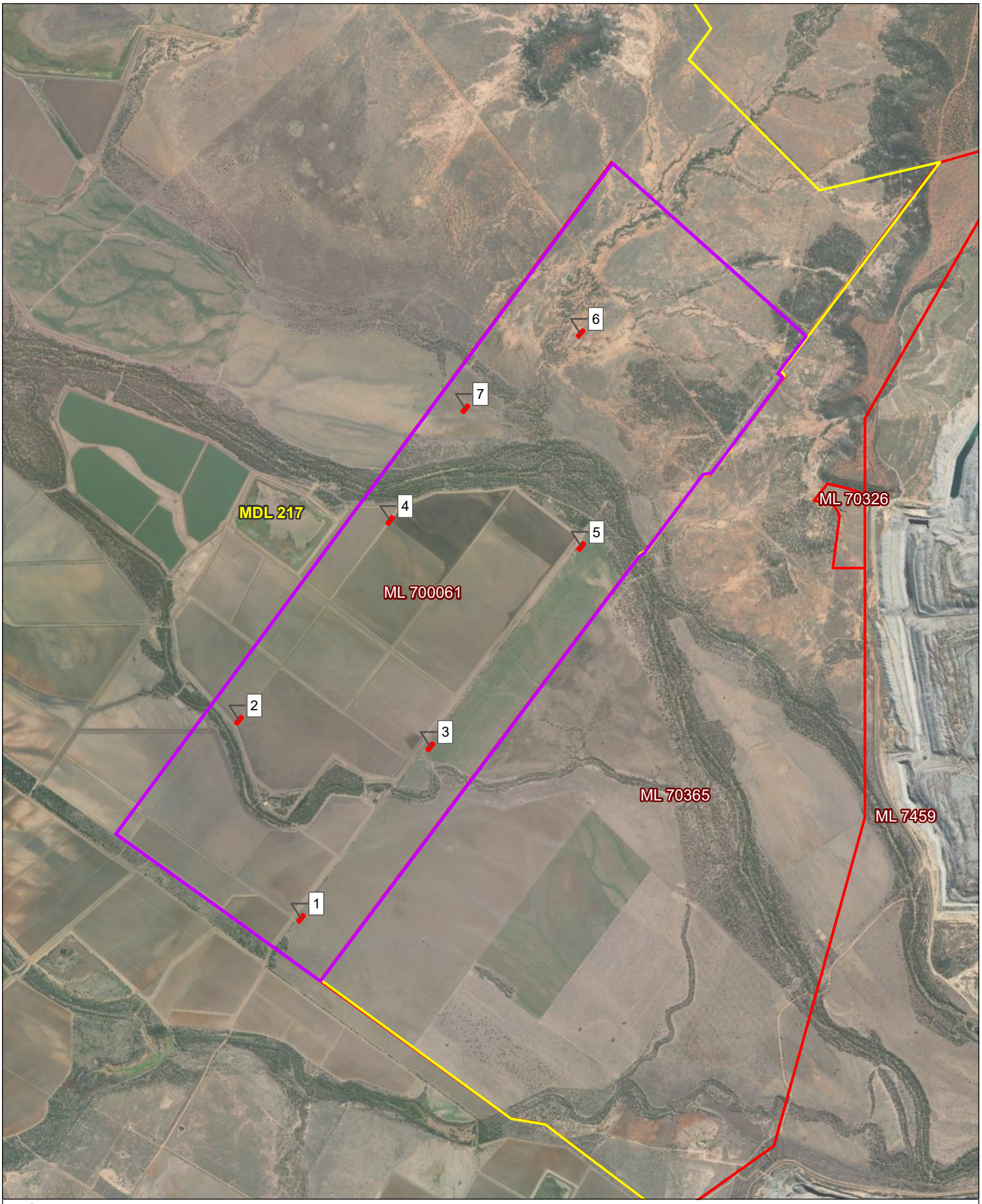
- City/Town
- Zone 1
- Highway
- Road
- Track
- Major Watercourse
- Project Location
- Drill Pad
- Approved Underground Mining Area
- Project Underground Mining Area

ENSHAM SOIL SURVEY

Regional Setting

FIGURE 1

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_Soil_F01 Regional Setting.mxd



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Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
Date:	29-Jan-2025
Drawn by:	JG

Drill Pad
Zone 1
Mining Leases
Mineral Development Licence (MDL) 217

ENSHAM SOIL SURVEY

Project Setting

SLR

FIGURE 2

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1.2 Relevant Guidelines and Standards

The following guidelines and standards were used for the Assessment:

- Regional Land Suitability Frameworks for Queensland, Department of Natural Resources and Mines and the Department of Science, Information Technology, Innovation and the Arts (DNRM and DSITI), 2013
- Australian Soil Classification – Third Edition, Isbell and National Committee on Soil and Terrain, 2021
- Guidelines for Surveying Soil and Land Resources (2nd edition), McKenzie et al., 2008
- Australian Soil and Land Survey Field Handbook (3rd edition), National Committee on Soil and Terrain, 2009
- Guidelines for Agricultural Land Evaluation in Queensland (2nd edition), Department of Natural Resources and Mines and the Department of Science, Information Technology, Innovation and the Arts (DNRM and DSITI), 2015, and
- Queensland Soil and Land Resource Survey Information Guideline (Version 2), Department of Resources, 2021.

1.3 Assessment Considerations

The Project is a continuation of the existing underground mine and will produce similar product tonnage to the approved operation. The Project will also continue to use existing surface infrastructure located on the existing approved MLs. The extension of the underground operation using existing infrastructure means that overall, there will be no surface construction or corresponding land disturbance required for the Project other than the addition of 7 Drill Pads.

1.4 Project Overview

Ensham Mine is an established open-cut and underground bord and pillar coal mine located approximately 35 kilometres east of Emerald in Queensland. It operates under EA EPML00732813, covering several mining leases. The current operations utilise ML 7459, ML 70326, ML 70365, and ML 70366, focusing on extracting coal from the Aries/Castor seam.

The proposed Project aims to extend the life of the existing underground operations by expanding into a new area identified as Zone 1, as shown in **Figure 2**. The total area of Zone 1 is 2,119 ha. Approval of this extension will enable Ensham Mine to continue coal production at its current rate while adhering to the existing EA limits. The extension will also prolong the mine's operational life until approximately 2037 and sustain substantial employment in the Central Highlands region through this period.

The mine is within the Central Highlands Regional Council area, surrounded by other significant coal mines and reserves. The Project area includes various land tenures, including freehold, reserve, and land leases, with portions also subject to a strata easement for stock routes.

The Project involves continuing underground mining operations using primarily existing infrastructure, minimising as far as possible the need for new construction. The extension will utilise current underground equipment, such as continuous miners, shuttle cars, and conveyors, to maintain production rates. The ROM stockpile and coal handling facilities will remain unchanged, and existing processing equipment will continue to be used.

To support the underground mining operations, seven Drill Pads will be constructed in Zone 1, as shown in **Figure 2**. These Drill Pads represent a total of 1.12 ha of disturbance within Zone 1. These Drill Pads will become utilised for gas flaring infrastructure. This is the only proposed surface infrastructure to be constructed as part of the Project.

Progressive rehabilitation of the open-cut mine is ongoing, with Pits C and D retained for continued underground access. Rehabilitation of Zone 1 will be integrated into the Project scope, aligning with the approved Progressive Rehabilitation Closure Plan (PRCP).

1.4.1 Flare Construction

Standard flare installation procedures will be employed in line with risk assessments to reduce the hazards of combustible material within an exclusion zone around the flare. This typically involves slashing the adjacent grass, and laying a base of gravel around the flare. Drilling to the coal seam must occur before the hole is cemented, which will allow gas to drain towards the surface. Minor quantities of drilling muds will be disposed of in accordance with appropriate rehabilitation methods. Gas is then ignited at a safe distance above the surface. Each flare would be approximately 8 m tall with the flare height (i.e. height of the ignited gas flame) being up to 3 m above the flare.

Each flare will be established in already cleared locations which are already approved for disturbance under the current EA. Flares will be constructed and operated at a time consistent with the mining schedule.

1.4.2 Flare Exclusion Areas

No additional material infrastructure other than installation of seven Drill Pads (flares) will be required. For safety, the installation of the flares includes an exclusion zone. The flare exclusion area will be fenced to prohibit wildlife and people from unauthorised entry. This exclusion area would be established on previously disturbed land and would not require any vegetation clearing (other than maintenance of grass levels to minimise fire risk). These locations would utilise existing tracks on existing mining leases for non-material construction purposes as well as ongoing general access and maintenance matters.

2.0 Methodology

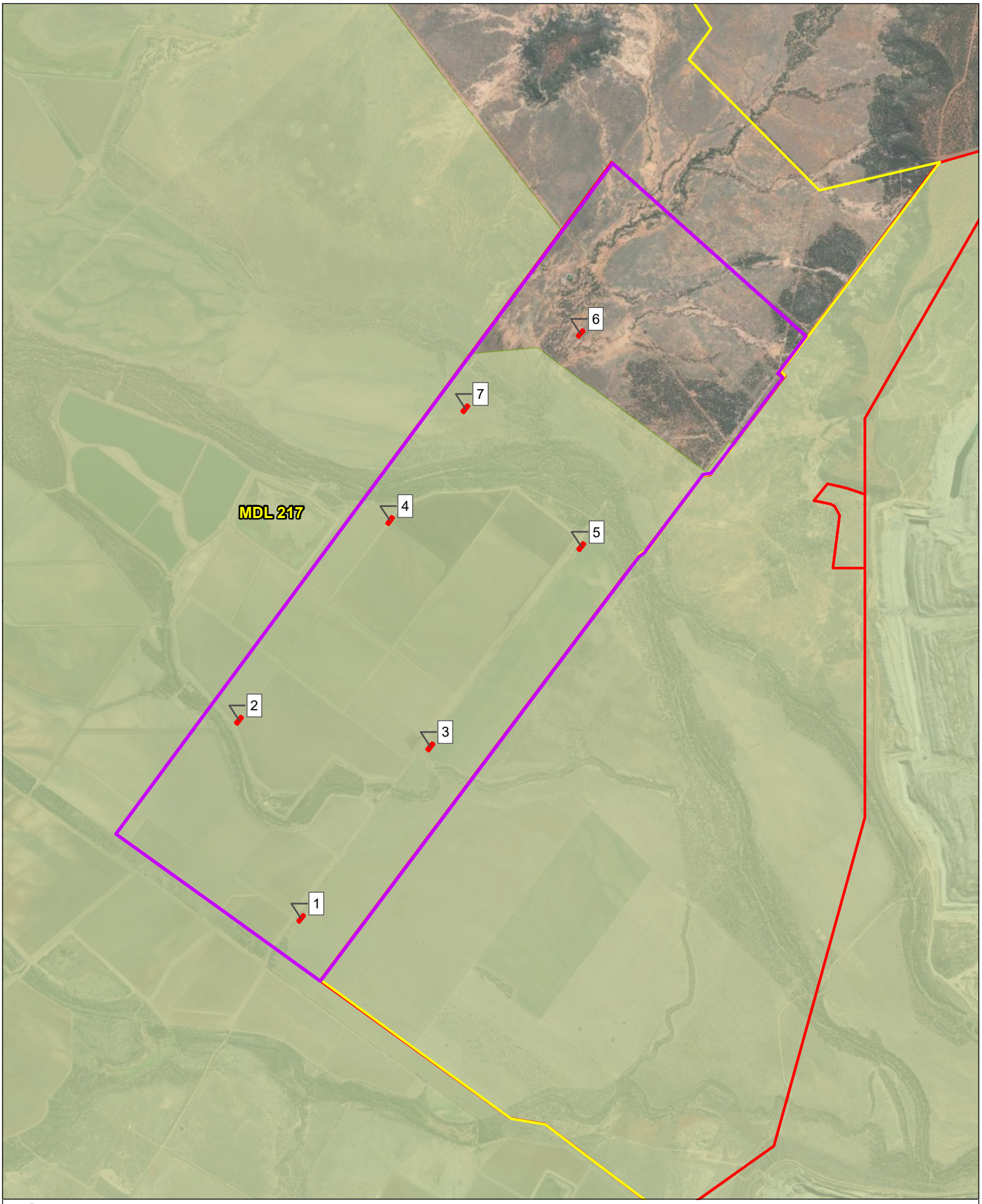
2.1 Desktop Review of Geology, Geomorphology, Land Systems and Soils

A desktop assessment was undertaken to establish background information on the soil and land resources within the Project. This included a review of:

- *Land of the Isaac-Comet Area, Queensland*, Story et al., 1967
- *Desktop Soils and Land Suitability Assessment*, GT Environmental, 2020
- *Geological Survey of Queensland: Map Sheet SF55-15 (Ensham)*, Geological Survey of Qld, 1969
- Site LIDAR data provided by Ensham Resources Pty Ltd, 2022
- *Climate Data Online (Emerald Airport – Station 035264)*, Bureau of Meteorology, 2022
- Queensland Land Use Mapping Program, 2016
- Satellite imagery accessed via Google Maps and Nearmap, 2022, and
- *Strategic Cropping Land (SCL) Trigger Map*, Department of Resources, 2021.

2.2 Regional Planning Interests Act

The *Regional Planning Interests Act of 2014* (RPI Act) identifies and protects areas of regional interest from inappropriate resource activity or regulated activity. Areas of regional interest identified in the RPI Act include Priority Agricultural Areas (PAA), Priority Living Area (PLA), Strategic Environmental Area (SEA) and Strategic Cropping Area (SCA). The Project intersects both PAA and SCA, where PAA is an area deemed as highly productive agricultural land by the relevant regional council under a regional plan and SCA consists of strategic cropping land (SCL) as identified in the SCL trigger map. The mapped PAA and SCL within and around the Project are shown in **Figure 3** and **Figure 4**. The status of land identified as PAA and SCA within the Project will not be challenged in the Assessment and will be considered as mapped.



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Scale:	1:50,000 at A4
Project Number:	620.041251
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Drawn by:	JG

- Drill Pad
- Zone 1
- Mining Leases
- Mineral Development Licence (MDL) 217
- Priority Agriculture Area

ENSHAM SOIL SURVEY

Priority Agriculture Area

SLR

FIGURE 3

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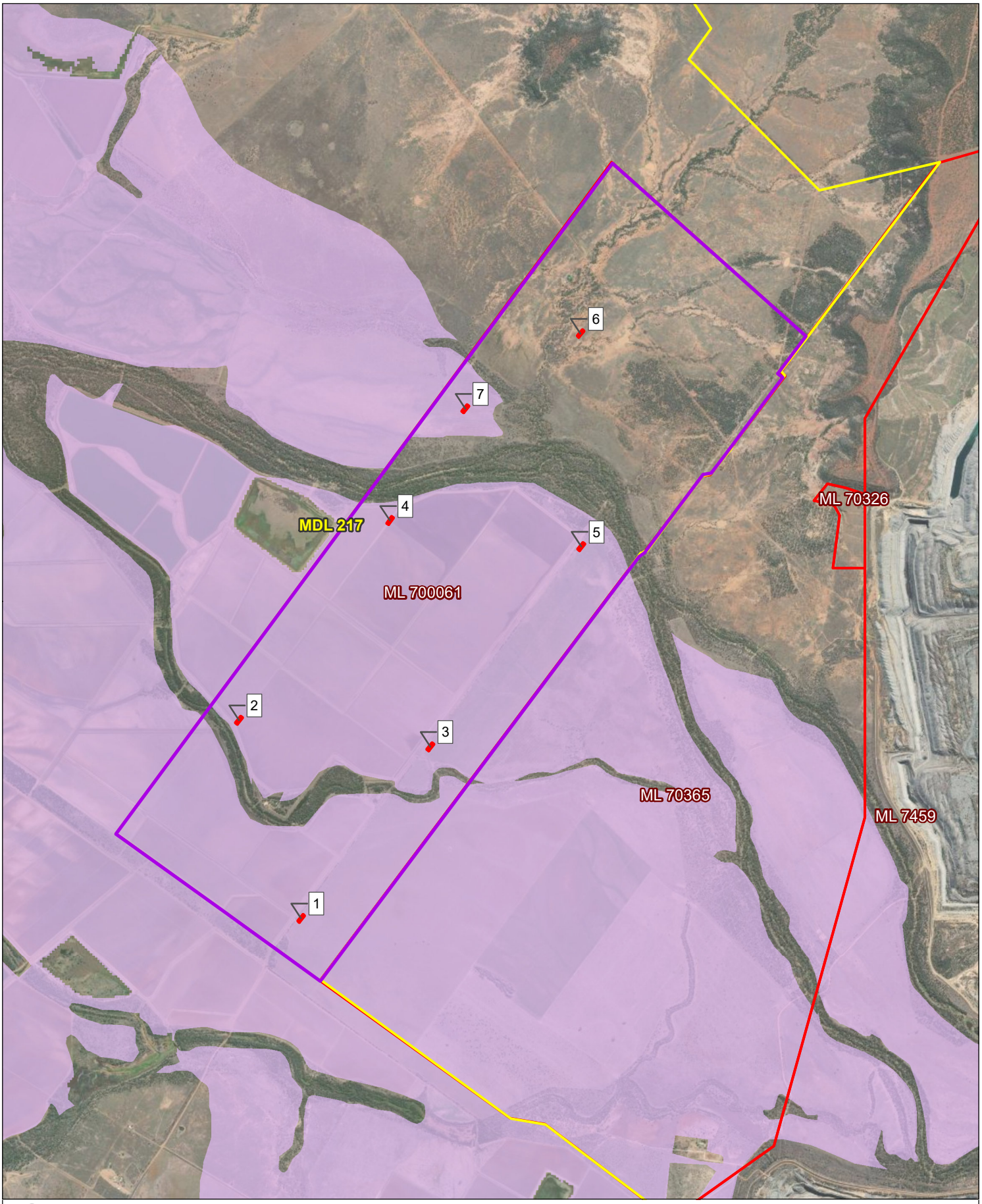

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Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
Date:	29-Jan-2025
Drawn by:	JG

Drill Pad
Strategic Cropping Land
Zone 1
Mining Leases
Mineral Development Licence (MDL) 217

ENSHAM SOIL SURVEY

Strategic Cropping Land

SLR

FIGURE 4

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2.3 Field Assessment and Sampling Program

2.3.1 Soil Characterisation

The field program was designed as an integrated soil survey, which assumes that land characteristics are interdependent and tend to occur in correlated sets (NCST, 2008). Preliminary survey points were located based on the desktop assessment and refined during the field survey according to the site observations and landform interpretation to target representative soil type identification and boundary delineation. Bore holes were excavated using a hand auger or soil corer to a maximum depth of 1.0 m or upon encountering refusal e.g., consolidated rock. Soil profile logging was undertaken in the field using SLR electronic soil data sheets, including Global Positioning System (GPS) recordings and photographs of the landforms and soil profiles, with **Appendix A** and **Appendix B** presenting the detailed and check site descriptions respectively.

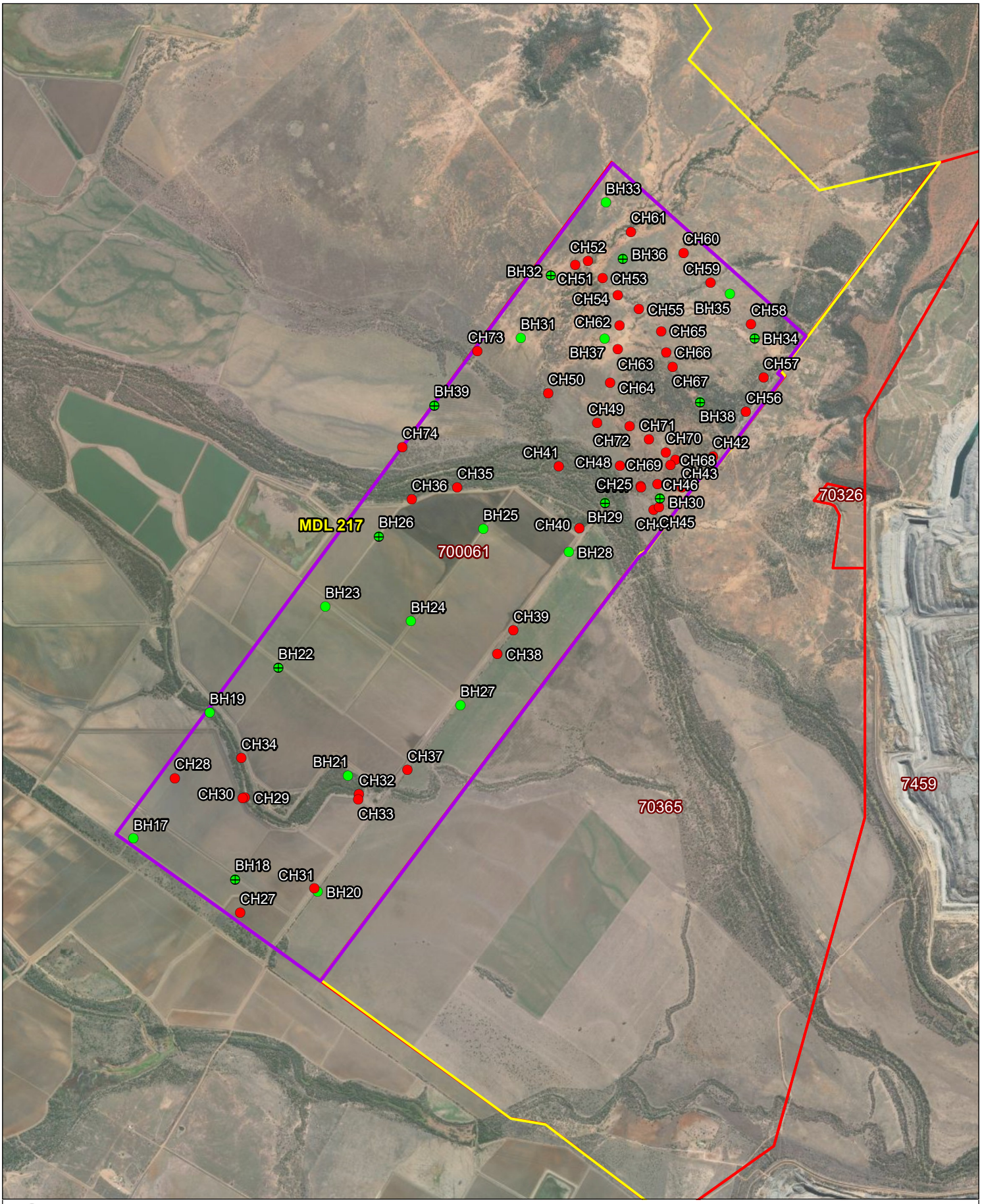
Three types of observations were used for this Assessment:

- Detailed sites – Excavated sites that allow for the identification of physical and chemical factors which characterise the major pedological features of the soil profile and allow the characterisation of an associated map unit
- Analysed sites – Detailed sites from which soil samples are collected and sent to a National Association of Testing Authorities (NATA) Australia accredited laboratory for analysis, and
- Check sites – Observations examined in sufficient detail to allocate the site to a specific soil type.

A total of 23 detailed sites (prefix BH) were assessed, with soil samples taken from each site. An additional 49 check sites (prefix CH) were assessed producing a survey density of 1 site per 29 ha, which satisfies a cartographic scale of 1:50,000 in accordance with the *Guidelines for Surveying Soil and Land Resources* (2nd edition) (McKenzie et al., 2008). Laboratory analysis was undertaken for 10 sites, representing 43% of the 23 detailed sites. Typical sample depths were 0-10, 20-30, 50-60 and 90-100 centimetres (cm). The frequency of the detailed, analysed and check sites are in accordance with the relevant guidelines (McKenzie et al., 2008). Locations of detailed, check and analysed sites are depicted in **Figure 5**.

Laboratory analysis was performed by Environmental Analysis Laboratory (EAL) at the Southern Cross University Lismore, a laboratory with NATA accreditation for the analyses conducted. The soil testing suite included:

- pH (1:5 water)
- Electrical conductivity (EC)
- Cation exchange capacity (CEC)
- Exchangeable sodium percentage (ESP)
- Colour (Munsell)
- Particle size analysis (PSA)
- Emerson aggregate test (EAT).



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Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
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SLR

Field Survey Locations

- Analysed
- Detailed
- Check site
- Zone 1
- Mining Leases
- Mineral Development Licence (MDL) 217

ENSHAM SOIL SURVEY

Field Survey Locations

FIGURE 5

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Soil salinity in the laboratory analysed samples was determined through the measurement of EC in a 1:5 soil:water suspension. These values were converted to the EC of a saturated extract (ECe) based on soil texture (Hazelton and Murphy, 2016). Laboratory certificates of analysis are shown in **Appendix C**.

Soil profiles were assessed in accordance with the *Australian Soil and Land Survey Field Handbook* (NCST, 2009) soil assessment procedures. Detailed soil profile descriptions were recorded covering the major parameters provided in **Table 1**. The soil type classification was assessed through the *Australian Soil Classification – Third Edition* (Isbell, 2021).

Table 1 Field assessment parameters

Detailed Field Assessment Parameters	
Horizon depth	Pan presence and form
Field texture grade	Permeability and drainage
Field colour (Munsell colour chart)	Field pH
Pedality structure, grade and consistence	Field moisture
Soil fabric and stickiness	Surface condition
Coarse fragments	Landform pattern and element
Mottles	Current land use
Segregations	Vegetation

2.3.2 Waste Rock Characterisation

A total of 12 waste rock samples were collected from drill cores from the exploration phase of the Project by an Ensham geologist. Samples selected for analysis included rock from the coal seam floor, roof and interburden. The samples were tested for their AMD characteristics, GAI of metals within the solid waste and ASLP leachability of metals. Based on the minor volumes of waste rock to be generated by the Project (143,000 m^3), the waste rock characterisation frequency has been designed to comply with the frequency suggested in MEND (2009), as shown in **Table 2**. Drill core locations of the waste rock analysed for the Project are shown in **Figure 6**.

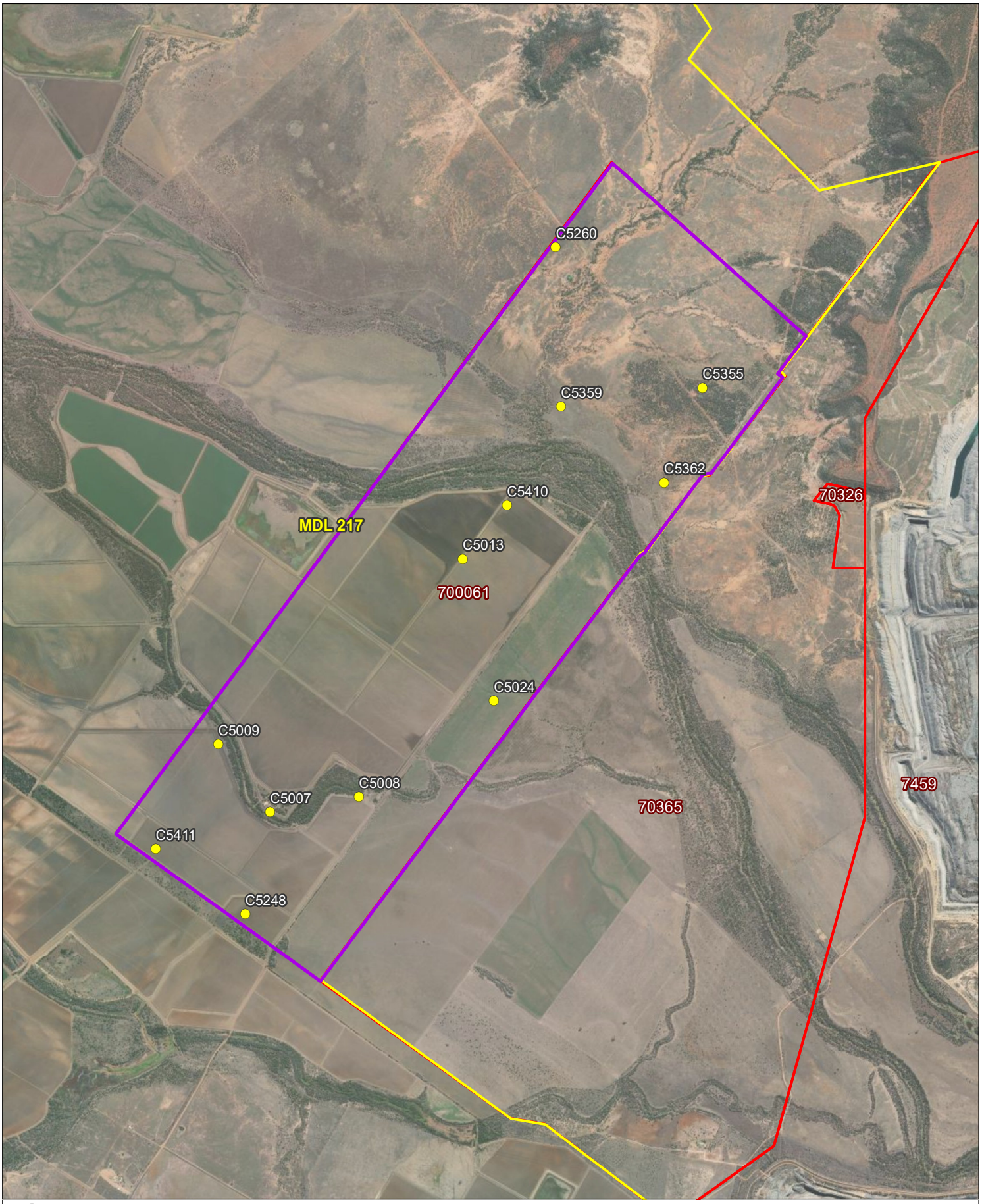
Table 2 Sampling frequency based on waste rock tonnage (MEND, 2009)

Tonnage of Unit (metric tonnes)	Minimum Number of Samples
<10,000	3
<100,000	8
<1,000,000	26
<10,000,000	80

The AMD waste rock characterisation assesses the Net Acid Generation (NAG) potential based on the total sulfur concentrations, which includes sulfur from both reactive acid producing sulfides and unreactive non-acid producing sulfates. As a result, the NAG may overestimate the actual acid producing potential of a material.

To evaluate the potential for overestimation of acid generation, all recent samples were also tested for HCl-extractable sulfur (SHCl). This method determines soluble sulphate from gypsum and a large proportion of iron and aluminium hydroxysulfate compounds (for example jarosite, natrojarosite, schwertmannite), which are generally insoluble in the surface environment. This method also determines some sulfur from organic matter, but not pyrite sulfur.

Quality assurance of the sampling results was achieved by including two (2) duplicate samples into the sampling suite. For the purpose of this Assessment, a 50% Relative Percent Difference (RPD) acceptance criteria has been adopted. RPD values with regards to the AMD characterisation and GAI classification involving total metal analysis were generally within the acceptable criteria. RPD values for ASLP leachability of metals showed numerous exceedances of the acceptable criteria, however this may be due to sample heterogeneity and/or in some cases, very low concentrations (which can lessen the applicability of the RPD acceptance criteria) and is not considered to impact the validity of the results.



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Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
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Drawn by:	JG

Wate Rock Borehole

Zone 1

Mining Leases

Mineral Development Licence (MDL) 217

ENSHAM SOIL SURVEY

Waste Rock Characterization

SLR

FIGURE 6

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_F06 Waste Rock characterisation - Zone 1.mxd

2.4 Land Classification Systems

The information reviewed and collected as part of the desktop and field assessments was used to determine land classifications. The land classification systems used for the Assessment are:

- Land suitability class, and
- Agricultural land class.

These classification systems are applied to the Assessment to consider specific and broad land uses. These systems and their purpose for assessing impacts to land resources are summarised in the following sections.

2.4.1 Land Suitability Class

The land suitability classification was applied across the Project in accordance with the *Regional Land Suitability Frameworks for Queensland* (DSITI & DNRM, 2013). This scheme uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil constraints. The scheme consists of eight limitations that classify the land based on the severity against the suitability subclasses for various land management options.

The suitability framework provides details for assessing which crops are suitable for individual mapped areas of land or soil and defines land suitable for grazing. Each limitation (refer Section 5.1) was assessed against a set of criteria tables described in the framework, with each limitation ranked against the suitability subclass from 1 (most suitable) through to 5 (least suitable) with the overall ranking of the land determined by its most significant limitation.

2.4.2 Agricultural Land Class

Agricultural land classification follows a hierarchical scheme that allows the presentation of interpreted land evaluation data to indicate the location and extent of agricultural land that can be used sustainably for a wide range of land uses with minimal land degradation. Three broad classes of agricultural land and one non-agricultural land class are identified in the *Agricultural Land Class System* (DSITI & DNRM, 2015).

3.0 Existing Environment

3.1 Climate

The nearest operational meteorological station is Emerald Airport (BOM Station 035264), located approximately 40 km southwest of the Project. The annual average rainfall from 1992 to present is 558.8 mm with most rain occurring between December and February. The annual mean maximum temperature is 30.0°C and the annual mean minimum temperature is 16.4°C. Average monthly rainfall and temperature for Emerald Airport is presented in **Table 3**.

Table 3 Average monthly climate data for Emerald Airport

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)	83.1	83.7	58.1	30.5	20.9	29.3	19.2	21.2	24.7	46.8	58.5	82.3	558.8
Mean Maximum Temperature (°C)	34.6	33.9	32.9	30.1	26.4	23.5	23.4	25.6	29.1	32.1	33.5	34.5	30.0
Mean Minimum Temperature (°C)	22.3	22.1	20.6	17.1	13.1	10.3	9.2	10.2	13.6	17.2	19.6	21.4	16.4

Source: Bureau of Meteorology January 2025

3.2 Surface Geology

A review of the surface geology Geological Survey of Queensland Emerald Region Sheet no. SF55-15 (GSQ, 1969) showed that the Project is underlain by:

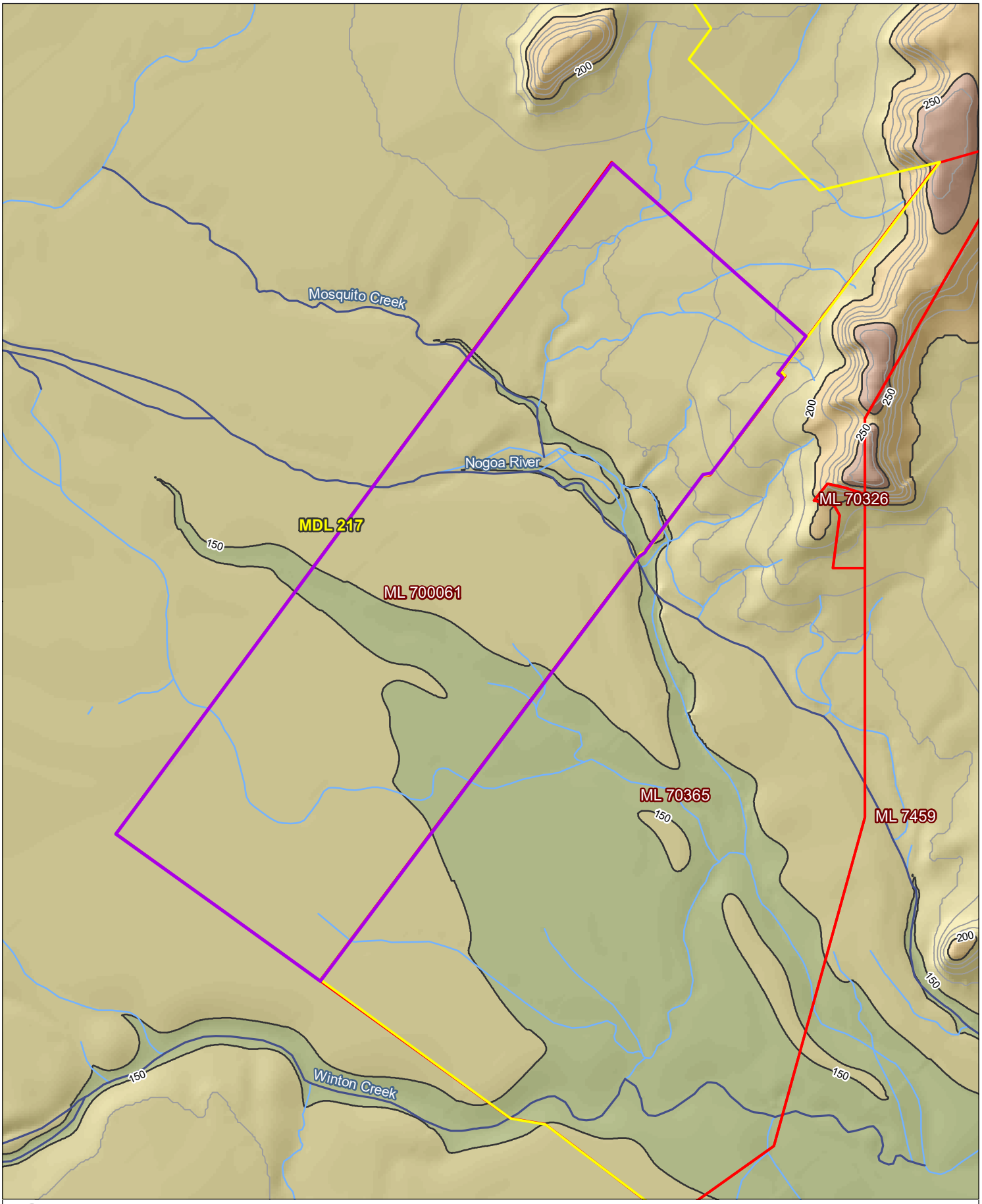
- River and Floodplain Deposits from the Quaternary Alluvium consisting of clay, silt, sand and gravel
- Undifferentiated Cainozoic Soil cover including soil, sand, siliceous and ferruginous gravel, and
- Argillaceous sandstone, laterised sediments, claystone, siltstone, sandstone and pebbly sandstone from the Tertiary Emerald Formation.

3.3 Topography and Hydrology

The Project lies within the Fitzroy Basin and within Nogoa River sub-basin. Watercourses within the Project are presented in **Figure 7**. The Nogoa River and a minor tributary, Mosquito Creek, intersect the Project from the west and join through the central portion of the Project. Minor tributaries traverse through the southwestern extent. These minor tributaries are perennial, and flow is largely attributable to controlled releases from Fairbairn Dam.

A review of the LiDAR data provided by Ensham shows the topography to be predominantly 150 to 200 mAHD (metres Australian Height Datum) across the Project. Elevations descend to 100 to 150 mAHD at the Nogoa River and Mosquito creek that intersect the Project.

Elevations of 100 to 150 mAHD are also present in a discrete area across the more southern portion of the Project.



0 0.5 1 km

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Drawn by:	JG

Major Watercourse
Minor Watercourse
Zone 1
Mining Leases
Mineral Development Licence (MDL) 217

Elevation (mAHD)
100 - 150
150 - 200
200 - 250
250 - 350

ENSHAM SOIL SURVEY

Topography and Hydrology

SLR

FIGURE 7

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_F07 Topography and Hydrology.mxd

3.4 Vegetation and Land Use

The Project is used for cropping and grazing, with the alluvial plains south of the Nogoa River used for irrigated cropping, and land to the north used for grazing of native and non-native pastures. A small portion on the land to the north of the river is mapped as grazing on irrigated modified pastures (QULMP, 2017), however based on observations made during a site visit November 2022, the area is used for non-irrigated woody fodder plants (Leucaena).

The southern portion of the Project comprises of channel irrigated levelled land for the cultivation of non-native crops. The northern most portion has been planted to *Cenchrus ciliaris* or exotic buffel grass for stock, and isolated trees consisting of *Acacias* and *Eucalyptus* are also present. Areas of remnant vegetation fringe the banks of the Nogoa River and its tributaries. Low brigalow woodland on alluvial plains occurs mostly within gullies/drainage features to the north within the Project but can also be found south of the Nogoa River (SLR, 2022a).

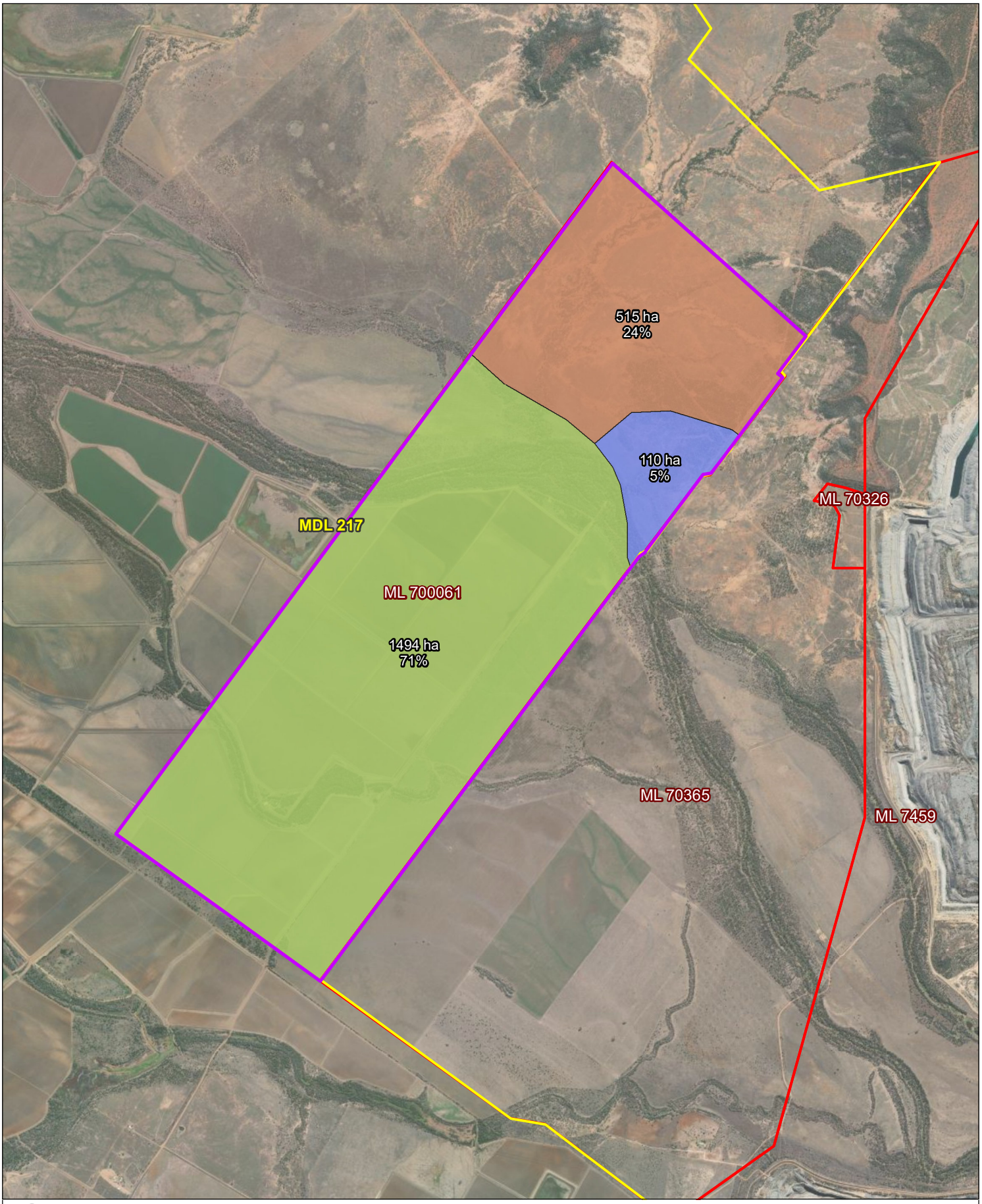
3.5 Land Systems

Three land systems occur within the Project (Story et al., 1967). **Table 4** below describes the land systems and areas across the Project and is depicted in **Figure 8**.

Much of the Project is dominated by the Comet land system which is described as alluvial plains with brigalow and cracking clay soil, often flooded, along major streams. The Comet land system comprises the entirety of the Project south of Mosquito Creek. The minor contributing land systems to the north are the Blackwater and Humboldt land systems. The Blackwater land system encompasses the Project's northern bounds while the Humboldt land system contributes minorly in the central north-eastern section of the Project and is bound by the Comet and Blackwater land systems.

Table 4 Land Systems in the Project

Land System	Land System Description	Area (ha)	Project %
Comet	Alluvial plains with brigalow and cracking clay soils, often flooded, along major streams.	1,494	71
Humboldt	Blackbutt and brigalow on weathered clay plains occurring in most parts of the area; texture-contrast and cracking clay soils.	110	5
Blackwater	Brigalow plains and cracking clay soils on weathered Tertiary clay and older rocks along the central axis of the area.	515	24
	Total	**2,119**	**100**



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
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SLR

Zone 1
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Mineral Development Licence (MDL) 217

Land Systems
Blackwater
Comet
Humboldt

ENSHAM SOIL SURVEY

Land Systems

FIGURE 8

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_Soil_F08 Land Systems.mxd

3.6 Waste Rock Source

The targeted coal seam at Ensham is part of the Permian age Rangal Coal Measures. The Rangal Coal Measures are characteristically non-marine sediments and low in sulfur, essentially deposited as one homogeneous unit. With regards to the waste rock characterisation, the coal seam and associated interburden/overburden may be accompanied by low concentrations of primary sulfides, mainly pyrite.

3.7 Previous Investigations

3.7.1 GT Environmental

GT Environmental (GT Environmental, 2020) conducted a desktop assessment on behalf of Ensham Resources Pty Ltd to assess the potential impacts of the Project on soil and land suitability values and provided a baseline assessment of the soil and land suitability.

3.7.1.1 Soil Classification

Soil types were classified in accordance with the ASC (2002) into the following groups:

- Endohypersodic and Epipedal Black, Grey or Brown Vertosols across much of the area south of a tributary that feeds the Nogoa River, with additional smaller areas present across the northern fringes of the Project
- Sodic Pedaric Brown Dermosols across the central and northern regions of the Project, along a tributary that feeds the Nogoa River, dividing the northern area of the Project
- Acidic Brown Clastic-Leptic Rudosols across the northern area of the Project.

3.7.1.2 Agricultural Land

The method for the agricultural land suitability classification was assessed in accordance with State Planning Policy 1/92: Development and the Conservation of Good Quality Agricultural Land and rated in terms of the Queensland Department of Housing Local Government Planning (DH&LGP) (1993).

The land suitability was classed as:

- Class 4 for cropping and grazing for the Endohypersodic and Epipedal Black, Grey or Brown Vertosols
- Class 3 and 4 for cropping and class 2 and 3 for grazing for the Sodic Pedaric Brown Dermosols
- Class 4 for cropping and grazing for the Acidic Brown Clastic-Leptic Rudosols.

These classes indicate the land in the Project might be unsuitable for cropping. However, some land could be suitable for grazing purposes.

3.7.2 Waste Rock Characterisation

Previous waste rock characterisations at Ensham investigated 66 overburden and reject samples in 2005 (URS, 2005) and 34 samples from drill holes that intersected the roof, interburden and floor of the then to be mined coal seam (URS, 2015).

3.7.2.1 URS 2005

Of the 2005 samples 88% of samples had a total sulfur content of less than or equal to 0.1%, the remaining 12% had a total sulfur content of between 0.1 to 0.75%, none of which are considered potential acid forming (PAF). All samples had a negative net acid production potential (NAPP), ranging from -9 kg H_2SO_4/t to -215 kg H_2SO_4/t (average for overburden -42 kg H_2SO_4/t and potential reject -46 H_2SO_4/t). The results indicate the samples were all non-acid forming (NAF).

3.7.2.2 URS 2015

Of the 2015 samples all had a negative NAPP, ranging from -1 kg H_2SO_4/t to -119.8 kg H_2SO_4/t (average -35.7 kg H_2SO_4/t). The results indicate the samples were all NAF.

4.0 Soil Survey Results

4.1 Soil Classification and Description

The field assessment and subsequent laboratory analysis indicated a total of three soil orders within the Project according to the Revised Australian Soil Classification (Isbell, 2021). These included Vertosols, Dermosols and Rudosols. Representative profile descriptions for all detailed profile descriptions are shown in **Appendix A** and check site descriptions are shown in **Appendix B**.

4.1.1 Vertosols

These are soils with the following characteristics:

- A clay field texture or 35% or more clay throughout the solum except for a thin, surface crusty horizons 0.03 m or less thick, and
- When dry, open cracks occur at some time in most years. These are at least 5 mm wide and extend upward to the surface or to the base of any plough layer, peaty horizon, self-mulching horizon, or thin, surface crusty horizon, and
- Slickensides and/or lenticular peds occur at some depth in the solum.

The Vertosols were further classified into Crusty Brown and Black Vertosols, Self-Mulching Grey Vertosols and Eutrophic Grey Vertosols.

Crusty Brown Vertosols were identified as the dominant Vertosol type.

The Vertosols across the Project generally consisted of greyish brown medium clay A horizons (topsoil) with moderate structure, overlying a medium to medium heavy clay B2 horizon with strong angular blocky structure. The topsoil showed strongly alkaline, non-sodic and low saline properties. The B2 horizon generally showed strongly alkaline, sodic and high saline properties.

4.1.2 Dermosols

These are soils other than Vertosols, Hydrosols and Calcarosols which:

- Have B2 horizons with a structure more developed than weak throughout the major part of the horizon, and
- Do not have clear or abrupt textural B horizons.

The Dermosols were further classified into Eutrophic Brown and Black Dermosols, Self-Mulching Black and Brown Dermosols, and Mesotrophic Red and Brown Dermosols.

Eutrophic Brown Dermosols were identified as the dominant Dermosol type.

The Dermosols across the Project generally consisted of very dark brown to very dark greyish brown light clay to medium clay A horizons (topsoil) with weak to moderate structure, overlying a light medium clay to medium clay B2 horizon with moderate to strong angular to sub angular blocky structure. The topsoil and subsoils showed variable pH, sodicity, and salinity properties.

4.1.3 Rudosols

Rudosols are other soils with negligible (rudimentary), if any, pedologic organisation apart from the minimal development of an A1 horizon or the presence of less than 10% of B horizon material. There is little or no texture or colour change with depth.

Rudosols in the Project were identified through four detailed and five check sites, as the soil survey of this Assessment was undertaken concurrently with a soil survey on an adjacent site (SLR, 2022b), four detailed and four of the check sites are located outside the Project.

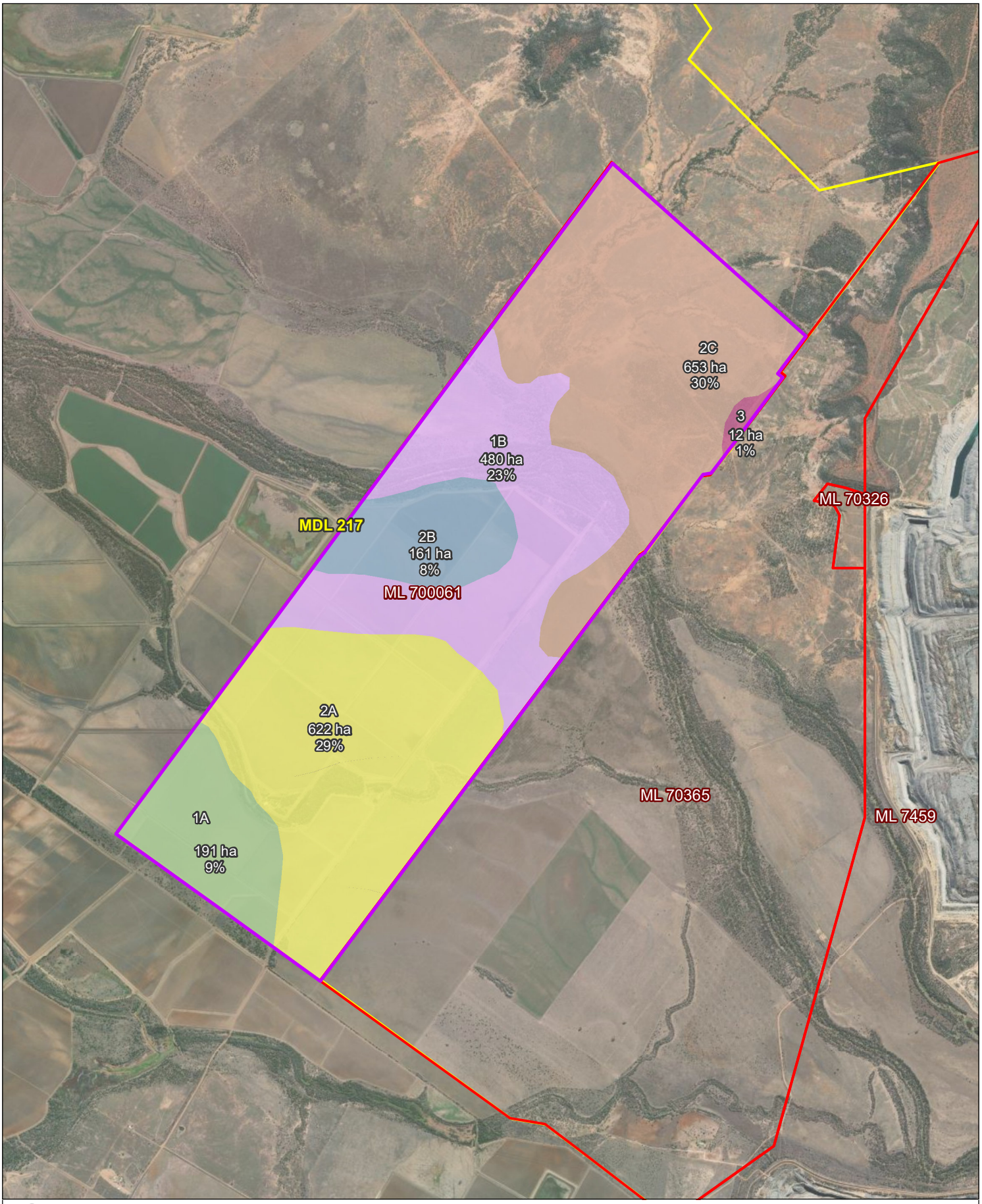
The Rudosols across the project generally consisted of sandy clay loam A horizons (topsoil) with weak structure, overlying a sandy clay loam to clayey sand B2 horizon with weak sub angular blocky structure. The topsoil showed strongly acidic, non-sodic and very low saline properties. Similarly, the B2 horizon showed strongly acidic, non-sodic and very low saline properties.

4.2 Soil Map Units

Within the Project, a total of six Soil Map Units (SMU) were identified based on the dominant ASC soil types as presented in **Figure 9**. The dominant soil type within the Project are Eutrophic Brown Dermosols, which are further divided into SMUs 2A, 2B, and 2C to represent the distinct areas across the Project where this soil type can be identified. The other SMUs are made up of smaller areas of Crusty Brown Vertosols and Clastic Rudosols. The dominant and sub-dominant soil types per SMU are shown in **Table 5**.

Table 5 SMU soil types

Soil Map Unit	Dominant Soil Type	Sub-Dominant Soil Type	Hectares (ha)	Percentage of Area (%)
1A	Crusty Brown Vertosols	Self-Mulching Grey Vertosol	191	9
1B	Crusty Brown Vertosols	Crusty Black Vertosols Eutrophic Grey Vertosols	480	23
2A	Eutrophic Brown Dermosols	Crusty Brown Dermosol Self-Mulching Black Dermosols Eutrophic Black Dermosols	622	29
2B	Eutrophic Brown Dermosols	Crusty Brown Dermosol	161	8
2C	Eutrophic Brown Dermosols	Mesotrophic Red Dermosols Crusty Brown Dermosol Mesotrophic Brown Dermosol	653	30
3	Clastic Rudosols	Crusty Rudosol	12	1
		Total	**2,119**	**100**



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
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Drawn by:	JG

Zone 1
Mining Leases
Mineral Development Licence (MDL) 217

Soil Map Unit Class

1A. Crusty Brown Vertosol
1B. Crusty Brown Vertosol
2A. Eutrophic Brown Dermosol
2B. Eutrophic Brown Dermosol
2C. Eutrophic Brown Dermosol
3. Clastic Rudosol

ENSHAM SOIL SURVEY

Soil Map Unit

SLR

FIGURE 9

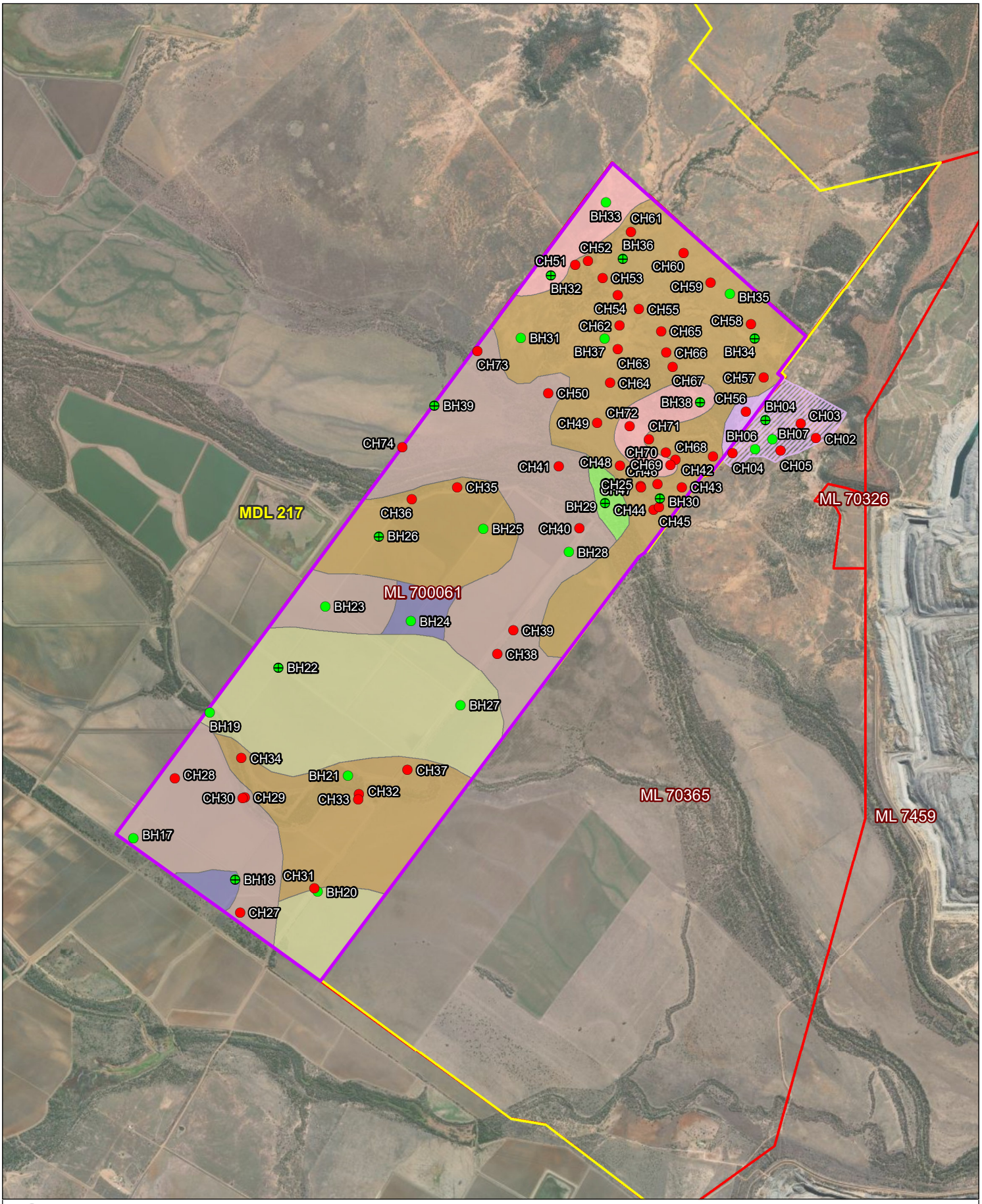
\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_Soil_F09 Soil Unit Map.mxd

SMUs with their associated detailed and check sites are summarised in **Table 6**. **Figure 10** shows sampling sites and ASC soil type.

Table 6 Field investigation sites

Soil Map Unit	ASC Dominant Soil Type	Detailed Site	Check Site
1A	Crusty Brown Vertosol	BH17, BH18	CH27, CH28, CH29, CH30
1B	Crusty Brown Vertosol	BH23, BH24, BH28, BH29, BH39	CH38, CH39, CH40, CH41, CH50, CH73, CH74
2A	Eutrophic Brown Dermosols	BH19, BH20, BH21, BH22, BH27	CH31, CH32, CH33, CH34, CH37,
2B	Eutrophic Brown Dermosols	BH25, BH26	CH35, CH36
2C	Eutrophic Brown Dermosols	BH30, BH31, BH32, BH33, BH34, BH35, BH36, BH37, BH38	CH25, CH42, CH43, CH44, CH45, CH46, CH47, CH48, CH49, CH51, CH52, CH53, CH54, CH55, CH56, CH57, CH58, CH59, CH60, CH61, CH62, CH63, CH64, CH65, CH66, CH67, CH68, CH69, CH70, CH71, CH72
3	Clastic Rudosols	BH04, BH06, BH07[1]	CH56 CH02, CH03, CH04, CH05[1]

[1] From previous investigation (SLR, 2022b).



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
Date:	15-Jan-2025
Drawn by:	JG

SLR

Field Survey Locations
- Analysed
- Detailed
- Check site
- Zone 1
- Mineral Development Licence (MDL) 217
- Mining Leases

- 1A. Brown Vertosol - 607.5 ha, 29%
- 1A. Grey Vertosol - 44.5 ha, 2%
- 1B. Black Vertosol - 18.5 ha, 1%
- 1B. Red Dermosol - 102.3 ha, 5%
- 2A. Black Dermosol - 401.9 ha, 19%
- 2B. Brown Dermosol - 931.4 ha, 43%
- 3. Rudosol - 12.4 ha, 1%
- Rudosols Outside the Project

ENSHAM SOIL SURVEY

Sample Sites & ASC Soil Types

FIGURE 10

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_F10 Sample Sites & ASC Soil Types.mxd

4.2.1 Soil Map Unit 1A

4.2.1.1 Description

The dominant soil type in SMU 1A included Crusty Brown Vertosols, and the subdominant soil type included Self-Mulching Grey Vertosols.

4.2.1.2 Location

SMU 1A is located in the southwestern portion of the Project and comprises approximately 191 ha or 9% of the Project.

4.2.1.3 Land Use

At the time of the field assessment, the land use within SMU 1A was irrigated cropping.

4.2.1.4 Management Considerations

Generally, the topsoil does not exhibit any characteristics that require any non-standard management practices. The subsoil generally exhibits high alkalinity, sodicity and high salinity. If the subsoil is exposed and not managed impacts may include:

- Erosion hazards including tunnel erosion
- Impeded soil infiltration and permeability, and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.2.2 Soil Map Unit 1B

4.2.2.1 Description

The dominant soil type in SMU 1B included Crusty Brown Vertosols, and the subdominant soil types included Crusty Black Vertosols and Eutrophic Grey Vertosols.

4.2.2.2 Location

SMU 1B is located across the middle portion of the Project and wraps around SMU 2B. It comprises approximately 480 ha or 23% of the Project. Drill Pads 5 and 7 will be in SMU 2A.

4.2.2.3 Land Use

At the time of the field assessment, the land use within SMU 1B comprised of mainly irrigated cropping land, while grazing pastures encompass the north-western end of the unit surrounding the Nogoa River and Mosquito Creek.

4.2.2.4 Management Considerations

Generally, the topsoil does not exhibit any characteristics that require any non-standard management practices. The subsoil generally exhibits moderate to high alkalinity, non-sodic to sodic and low to very low salinity. If the subsoil is exposed and not managed, impacts may include:

- Erosion hazards including tunnel erosion
- Impeded soil infiltration and permeability, and

- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.2.3 Soil Map Unit 2A

4.2.3.1 Description

The dominant soil type in SMU 2A included Eutrophic Brown Dermosols, and the subdominant soil types included Crusty Brown Dermosols, Self-Mulching Black Dermosols, and Eutrophic Black Dermosols.

4.2.3.2 Location

SMU 2A is located across the south-eastern portion of the Project and comprises approximately 622 ha or 29% of the Project. Drill Pads 1, 2 and 3 will be in SMU 2A.

4.2.3.3 Land Use

At the time of the field assessment, the land use within SMU 2A was irrigated cropping.

4.2.3.4 Management Considerations

Generally, the topsoil and subsoil exhibit high alkalinity, sodic and medium salinity properties. If the subsoil is exposed and not managed, in addition to severe agricultural productivity limitations, impacts may include:

- Erosion hazards including tunnel erosion
- Impeded soil infiltration and permeability, and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.2.4 Soil Map Unit 2B

4.2.4.1 Description

The dominant soil type in SMU 2B included Eutrophic Brown Dermosols, and the subdominant soil types included Crusty Brown Dermosols.

4.2.4.2 Location

SMU 2B is located in the middle of the Project and is bound by SMU 1B, extending to the western border of the Project. SMU 2B comprises approximately 161 ha or 8% of the Project. Drill Pad 4 will be in SMU 2A.

4.2.4.3 Land Use

At the time of the field assessment, the land use within SMU 2B was irrigated cropping.

4.2.4.4 Management Considerations

Generally, the topsoil does not exhibit any characteristics that require any non-standard management practices. The subsoil generally exhibits high alkalinity, sodic and medium salinity properties. If the subsoil is exposed and not managed, in addition to severe agricultural productivity limitations, impacts may include:

- Erosion hazards including tunnel erosion

- Impeded soil infiltration and permeability, and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.2.5 Soil Map Unit 2C

4.2.5.1 Description

The dominant soil type in SMU 2C included Eutrophic Brown Dermosols, while the subdominant soil types included Mesotrophic Red Dermosols, Mesotrophic Brown Dermosols, and Crusty Brown Dermosols.

4.2.5.2 Location

SMU 2C is located at the north-eastern end of the site and borders SMU 1B in the south-west. It encompasses approximately 653 ha or 30% of the Project. Drill Pad 6 will be in SMU 2A.

4.2.5.3 Land Use

At the time of the field assessment, the land use within SMU 2C was predominantly grazing of modified pastures and native vegetation.

4.2.5.4 Management Considerations

Generally, the topsoil does not exhibit any characteristics that require any non-standard management practices. The subsoil exhibits mildly acidic to very strongly alkaline, non-sodic to strongly sodic and high to very low salinity properties. If subsoils with high alkalinity, strong sodicity and high salinity are exposed and not managed, in addition to severe agricultural productivity limitations, impacts may include:

- Erosion hazards including tunnel erosion
- Impeded soil infiltration and permeability, and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.2.6 Soil Map Unit 3

4.2.6.1 Description

The soil type of SMU 3 included Clastic Rudosols.

4.2.6.2 Location

SMU 3 is located in the northwestern portion of the Project, bounded to the west by SMU 2C. It comprises approximately 12 ha or 0.5% of the Project.

4.2.6.3 Land Use

At the time of the field assessment, the land use within SMU 3 was grazing of native vegetation.

4.2.6.4 Management Considerations

The topsoil and subsoil both exhibit strongly acidic properties. The non-uniformity and lack of structure typical of this soil types means impacts to management may include:

- Erosion hazards including tunnel erosion
- Impeded soil infiltration and permeability, and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.3 Erosion Potential

An Emerson aggregate test (EAT) semi-quantitatively classifies the coherence of soil aggregates in water to provide an indication of dispersive properties and susceptibility to erosion. The ratings are based on a hierarchical class system where a rating of 1 being the most dispersive and 8 being non-dispersive.

Topsoil with EAT ratings of 3 and 4 were present in 90% of samples, indicating a moderately high potential of dispersion and erosion. The remainder of topsoil samples had an EAT rating of 2, indicating a high potential for dispersion. Approximately 83% of subsoil samples have EAT ratings of 3 and 4 with a moderately high potential of dispersion and erosion. The remaining 17% of subsoil samples have a high dispersion and erosion potential of EAT 2, indicating a high potential for dispersion.

Once the dispersive subsoils are disturbed, the potential for erosion may increase. If this disturbance occurs within the vicinity of a drainage line, this could impact on the health of downstream watercourses through an increase in sediment load. Full EAT results are shown in **Appendix D**.

4.4 Waste Rock Characterisation

4.4.1 Additional Waste Rock Characterisation

To supplement the previous waste rock characterisations, 12 samples from the Project were analysed for their Geochemical Abundance Index of total metals (GAI), the Australian Standard Leaching Procedure (ASLP) and Acid Mine Drainage (AMD) characteristics. In addition to the standard parameters, samples were further assessed for their HCl-extractable sulfur concentrations. The incorporation of HCl-extractable sulfur resulted in a reduction of the Maximum Potential Acidity (MPA) in all 12 samples, confirming the conservative nature of the calculated standard NAPP.

4.4.2 Acid Producing Potential

The additional characterisation of 12 drill core waste rock samples from the Project (**Figure** 11 and **Table 7**) suggests that all 12 samples are non-acid forming (NAF). The net acid producing potential (NAPP) of all 12 samples ranges from negative 6.0 to negative 110 kg/H_2SO_4/tonne. Combined with the alkaline NAG pH, the negative NAPP indicates a strong and available alkaline buffering capacity.

The comparison between total and HCl-extractable sulfur shows that in all but one of the 12 drill core waste rock samples, sulfur is mostly present as primary reactive sulfide (range 30.1% to 82.1%, average 61.0% MPA).

Figure 11 AMD characteristics of total 12 samples collected from drill cores in the Project

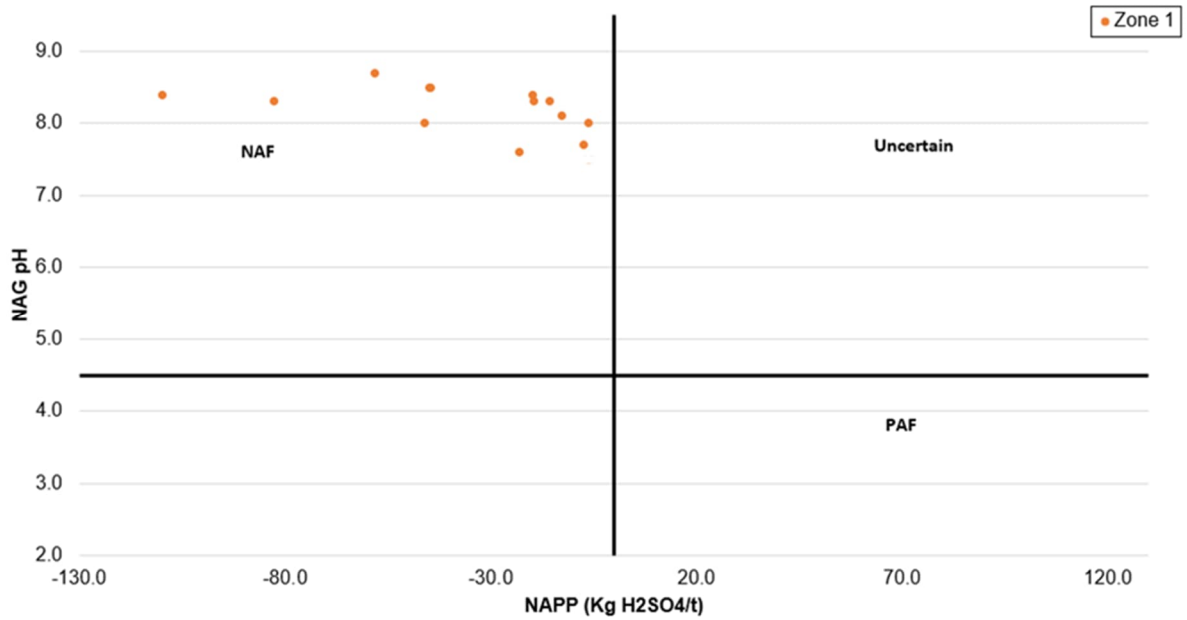


Table 7 Summary of test results for 12 additional Ensham waste rock samples

Sample ID	NAG (pH units)	MPA (kg H_2SO_4/t based on total S)	MPA (kg H_2SO_4/t based on reactive S)	ANC (kg H_2SO_4/t)	NAPP (kg H_2SO_4/t based on total S)	NAPP (kg H_2SO_4/t based on reactive S)
C5411	8.5	0.704	0.490	45	-44.3	-44.5
C5024	8.4	0.306	0.092	110	-109.7	-109.9
C5009	8.1	0.582	0.398	13	-12.4	-12.6
C5008	8.7	0.245	-0.245	58	-57.8	-58.2
C5007	8.0	0.306	-0.031	46	-45.7	-46.0
C5013	8.3	0.766	0.490	16	-15.2	-15.5
C5260	7.7	1.011	0.643	7.9	-6.9	-7.3
C5355	8.5	1.194	0.980	46	-44.8	-45.0
C5248	7.6	1.317	0.888	24	-22.7	-23.1
C5362	8.3	0.429	0.214	83	-82.6	-82.8
C5359	8.4	0.429	0.214	20	-19.6	-19.8
C5410	8.0	0.613	0.398	6.6	-6.0	-6.2

4.4.3 Geochemical Abundance Index (GAI)

The geochemical abundance index (GAI) can be used to estimate the enrichment of metals in the samples relative to median crustal concentration. The GAI is expressed on a log 2 scale. The GAI was developed by Förstner et al., (1993) and is defined as follows:

$$GAI = log_2 \left({}^{C}/_{(1.5 * B)} \right) \qquad \begin{matrix} C = measured\ concentration\ in\ sample \\ B = average\ crustal\ abundance \end{matrix}$$

The enrichment ranges of a metal based on the GAI values are interpreted as follow:

- GAI=0 indicates <3 times median crustal abundance
- GAI=1 indicates 3 to 6 times median crustal abundance
- GAI=2 indicates 6 to 12 times median crustal abundance
- GAI=3 indicates 12 to 24 times median crustal abundance
- GAI=4 indicates 24 to 48 times median crustal abundance
- GAI=5 indicates 48 to 96 times median crustal abundance
- GAI=6 indicates more than 96 times median crustal abundance

A GAI value of 3 is taken as the threshold for predicting potential metalliferous drainage from samples. The median crustal abundances used to compare results against in the GAI are provided in **Table 8**.

Table 8 Median crustal abundance for trace metals (Berkman and Ryall, 1976; Bowen, 1979)

Name	Symbol	Median Crustal Abundance (mg/kg)
Aluminium	Al	71000
Arsenic	As	6
Beryllium	Be	6
Boron	B	8.6
Cadmium	Cd	0.35
Cobalt	Co	8
Chromium	Cr	70
Copper	Cu	30
Iron	Fe	40000
Manganese	Mn	1000
Molybdenum	Mo	2
Nickel	Ni	50
Lead	Pb	35
Zinc	Zn	90
Selenium	Se	0.4
Vanadium	V	90

The GAI assessment of the 12 drill core waste rock samples shows that the waste rock is depleted with regards to most metals. A slight enrichment only exists for cobalt, molybdenum and selenium.

Table 9 GAI summary of 12 waste rock samples in the Project

Sample ID	Al	As	Be	B	Cd	Co	Cr	Cu	Fe	Pb	Mn	Mo	Ni	Zn	Se	V
C5411	-2	0	-3	-5	-2	0	-2	0	0	-3	-1	0.5	-1	-1	1	-8
C5024	-4	0	-3	-5	-3	0	-3	0	0	-3	0	0.5	-1	-1	1	-3
C5009	-2	-1	-3	-5	-3	0	-3	0	-1	-2	-1	0.5	-1	-1	1	-3
C5008	-3	-1	-3	-5	-3	0	-3	-1	-1	-2	0	0.5	-1	-1	1	-3
C5007	-2	0	-3	-5	-3	0	-2	-1	0	-4	0	2	-1	-1	1	-3
C5013	-3	0	-3	-5	-3	0	-3	0	-1	-2	-1	0.5	-1	-1	1	-3
C5260	-3	-1	-3	-5	-3	1	-3	0	-1	-2	-3	2	0	0	1	0
C5355	-3	0	-3	-5	-3	0	-3	0	-1	-3	-2	0.5	-1	-1	1	-3
C5248	-2	-1	-2	-5	-3	1	-2	0	0	-2	0	2	0	0	1	-4
C5362	-3	0	-3	-5	-3	0	-2	0	-1	-3	-1	0.5	-1	-1	1	-6
C5359	-3	0	-3	-5	-3	0	-2	0	-1	-2	-1	0.5	-1	-1	1	-2
C5410	-3	0	-3	-5	-3	1	-3	0	-2	-2	-3	1	-1	-1	1	-8

4.4.4 Waste Rock Leachate Characteristics

The Australian Standard Leaching procedure (ASLP) subjects the waste rock samples to a 1:5 deionised (DI) water leach. The leachate is then tested for dissolved metal concentrations. ASLP results for the 12 samples from the Project are shown in **Table 10**. Water quality parameters are compared against the toxicant default guideline values for water quality in aquatic ecosystems (95% protection level) of the Australian & New Zealand Guidelines for Fresh & Marine Water Quality (Australian Government, 2022).

Water quality limit exceedances in the 1:5 DI leachate occurred for dissolved aluminium, arsenic, copper, cobalt, zinc, lead, molybdenum, nickel, selenium and vanadium. At the pH values measured (pH 8.9 – 9.8) most of these metals should not be mobile. Hence, the exceedances of these metal are likely due to the presence of natural clays (Brookins; 1988, Meunier; 1994), which will disperse and potentially pass through the standard (0.45 µm) filtration as particles.

Table 10 ASLP results of the 12 drill core waste rock samples compared to the aquatic ecosystem 95% protection level

Parameter	pH	EC	Al	As	Cd	Cu	Pb	Mo	Zn	B	Cr	Co	Mn	Ni	Se	V
Unit	pH Unit	µS/cm	mg/L >pH 6.5	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L (total)	mg/L
Guideline Value	-	-	0.055	0.024	0.0002	0.0014	0.0034	0.034	0.008	0.94	0.0033	0.0014	1.9	0.011	0.011	0.006
C5411	9.8	250	6.8	0.045	<0.0001	<0.001	<0.001	0.008	<0.005	0.036	0.002	<0.001	0.013	<0.001	0.006	0.028
C5024	9.4	160	1.6	0.047	<0.0001	<0.001	<0.001	0.002	<0.005	0.019	0.002	<0.001	<0.005	<0.001	<0.003	0.010
C5009	9.8	240	8.2	0.051	<0.0001	0.001	<0.001	0.029	<0.005	0.034	0.002	0.001	0.006	0.002	0.008	0.024
C5008	9.6	180	5.0	0.031	<0.0001	<0.001	<0.001	0.006	<0.005	0.018	0.002	<0.001	0.011	<0.001	<0.003	0.018
C5007	9.4	190	2.5	0.016	<0.0001	<0.001	<0.001	0.039	<0.005	0.016	0.003	<0.001	0.016	<0.001	0.004	0.007
C5013	9.6	170	12	0.18	<0.0001	0.002	0.002	0.034	0.010	0.035	0.003	0.003	0.005	0.003	0.009	0.031
C5260	9.3	150	9.8	0.024	<0.0001	0.002	0.001	0.018	0.013	0.031	0.002	0.001	0.010	0.002	0.010	0.012
C5355	9.6	210	16	0.15	<0.0001	0.001	<0.001	0.016	0.013	0.034	0.003	0.003	0.014	0.004	0.007	0.024
C5248	9.7	200	11	0.030	<0.0001	0.004	0.002	0.057	0.008	0.037	0.002	0.004	0.006	0.004	0.010	0.018
C5362	8.9	200	1.8	0.003	<0.0001	<0.001	<0.001	0.018	<0.005	0.028	0.001	<0.001	<0.005	<0.001	0.010	0.008
C5359	9.2	86	7.3	0.043	<0.0001	0.001	<0.001	0.032	0.005	0.037	0.002	<0.001	<0.005	0.001	0.011	0.035
C5410	9.6	230	6.4	0.081	<0.0001	<0.001	<0.001	0.018	<0.005	0.033	0.003	<0.001	<0.005	0.001	0.009	0.024

4.5 Soil Resources

Based on the soil survey results, topsoil and subsoil resources are summarised in **Table 11** and **Table 12**. Soil resources are presented for informative purposes only. Soil stripping is proposed for the Drill Pad disturbance areas which makes up less than 0.2% of the Project.

Table 11 Available topsoil resource summary

Topsoil Map Unit	ASC Soil Type	Hectares (ha)	Topsoil Strip Depth (m)	Topsoil Volume (m^3)
1A	Crusty Brown Vertosol	191	0.20	382,000
1B	Crusty Brown Vertosol	480	0.20	960,000
2A	Eutrophic Brown Dermosol	622	0.30	1,866,000
2B	Eutrophic Brown Dermosol	161	0.10	161,000
2C	Eutrophic Brown Dermosol	653	0.21	1,371,300
3	Clastic Rudosol	12	0.2	24,000
			Topsoil Volume Available	**4,796,800**

Table 12 Available subsoil resource summary

Subsoil Map Unit	ASC Soil Type	Hectares (ha)	Subsoil Strip Depth (m)	Subsoil Volume (m^3)
1A	Crusty Brown Vertosol	191	0.80	1,528,000
1B	Crusty Brown Vertosol	480	0.80	3,840,000
2A	Eutrophic Brown Dermosol	622	0.70	4,354,000
2B	Eutrophic Brown Dermosol	161	0.90	1,449,000
2C	Eutrophic Brown Dermosol	653	0.79	5,158,700
3	Clastic Rudosol	12	0.10	12,000
			Subsoil Volume Available	**16,341,700**

5.0 Soil and Land Resource Impact Assessment

The Assessment takes into consideration Land Suitability and Agricultural Land Classifications associated with the Project. This includes a comparison between pre- and post-mining activities. As described in Section 5.2.3 and 5.4.2, mining operations will use existing services and infrastructure, and therefore there will be no further disturbance other than the addition of 7 Drill Pads to the soil and land in the Project. Due to the minimal surface footprint from the construction of each flare (each Drill Pad exclusion area is 80 m by 20 m, which equates to 0.16 hectares (ha)),), no material impact will be present on the land inside the Project. Drill Pad construction will therefore not influence the Land Suitability Class or the Agricultural Land Class areas categorised from the soils in the Assessment.

5.1 Land Suitability Methodology

The information required for the land suitability assessment was collected and verified on the ground during the field survey, the laboratory analysis program, and the desktop assessment. The land suitability classification was applied across the Project in accordance with the *Regional Land Suitability Frameworks for Queensland* (DNRM and DSIT, 2013), in particular *Section 10 Suitability Framework for the Inland Fitzroy and Southern Burdekin Area* as it relates to the Project. The suitability framework uses the soil and land attributes to derive detailed rating tables for a range of land use requirements. There are eight land use requirements expressed as limitations for the inland Fitzroy and southern Burdekin area. The limitations classify the land based on the severity of the soil, and land attributes, and are ranked as suitability subclasses for various land management options. The eight limitation categories associated with the soil and land attributes assessed by the framework are:

- Water erosion (E)
- Erosion hazard, subsoil erodibility (Es)
- Soil water availability (M)
- Narrow moisture range (Pm)
- Surface condition (Ps)
- Rockiness (R)
- Microrelief (Tm), and
- Wetness (W).

The suitability framework provides the detail for assessing which crops are suitable for individual mapped areas of land or soil, in addition the suitability of the land for grazing is also considered. Each hazard was assessed against a set of criteria tables, as described in the guideline, with each hazard ranked from 1 (most suitable) through to 5 (least suitable) with the overall ranking of the land determined by its most significant limitation, as described in **Table 13**.

Table 13 Land Suitability Classes (DNRM and DSIT, 2013)

Class	Description
1	Suitable land with negligible limitations and is highly productive requiring only simple management practices.
2	Suitable land with minor limitations which either reduce production or require more than simple management practices to sustain the use.

Class	Description
3	Suitable land with moderate limitations. Land which is moderately suited to a proposed use but requires significant inputs to ensure sustainable use.
4	Marginal land with severe limitations which make it doubtful whether the inputs required to achieve and maintain production outweigh the benefits in the long term.
5	Unsuitable land with extreme limitations that precludes its use.

5.2 Pre-Mining Land Suitability Results

5.2.1 Pre-Mining Land Suitability for Cropping

The land suitability assessment for cropping indicates the main limitations for the Project are soil wetness (W) and soil water availability (M). Soil wetness is predominantly influenced by the permeability and drainage capacity of the soil. Soil water availability is predominately influenced by the soil texture. The land suitability ratings are as follows:

- Approximately 832 ha of land associated with SMU 1A, 1B and 2B is rated as Class 4
- Approximately 1,287 ha of land associated with SMU 2A, 2C and 3 is rated as Class 5.

It is noted that irrigated cropping is undertaken across most of the Project including areas rated as Class 5 for cropping. The land suitability framework provides guidance and in some circumstances, there can be some difference between a land suitability rating and land use. The main soil related limitations for the Project are soil wetness (W) and soil water availability (M), which can be managed in part by irrigation practices and allow for successful cropping operations. Results for the Land Suitability Assessment for cropping are outlined in **Table 14** and shown in **Figure 12**, with the detailed Land Suitability Assessment provided in **Appendix E**.

5.2.2 Pre-Mining Land Suitability for Grazing

The land suitability assessment for grazing indicates the main limitations for the Project are soil wetness (W) and soil water availability (M) and ratings as follows:

- Approximately 832 ha of land associated with SMU 1A, 1B and 2B is rated as Class 2
- Approximately 1,275 ha of land associated with SMU 2A and 2C is rated as Class 3
- Approximately 12 ha of land associated with SMU 3 is rated as Class 5.

Results for the Land Suitability Assessment for grazing are outlined in **Table 15** and shown in **Figure 12**, with the detailed Land Suitability Assessment provided in **Appendix E**.

5.2.3 Post-Mining

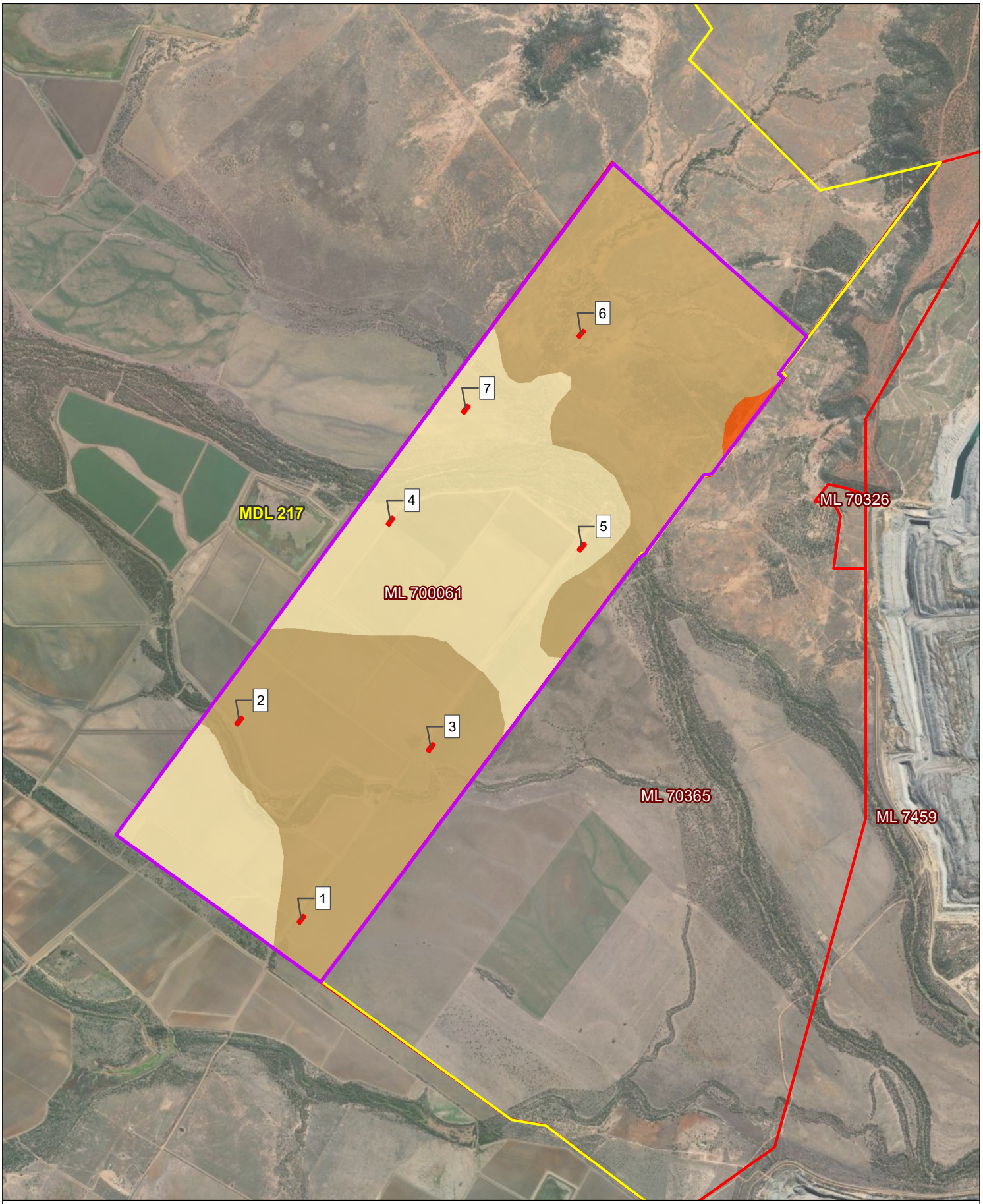
Land suitability classes for areas not scheduled for the proposed mining minor construction footprint (ie 7 Drill Pads) will remain the same. Surface disturbance predicted for this Project will be limited to the Drill Pad construction footprint. Upon Drill Pad decommission, these classes will remain the same post-mining. Changes in the areas of land suitability classes within the Project Area between pre- and post-mining are summarised in **Table 14** and **Table 15**.

Table 14 Pre-and post-mining cropping Land Suitability Class

Cropping Suitability Class	Pre-Mining		Post-Mining	
	Ha	%	Ha	%
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	832	39	832	39
5	1,287	61	1,287	61
Total	**2,119**	**100**	**2,119**	**100**

Table 15 Pre-and post-mining grazing Land Suitability Class

Grazing Suitability Class	Pre-Mining		Post-Mining	
	Ha	%	Ha	%
1	0	0	0	0
2	832	39	832	39
3	1,275	60	1,275	60
4	0	0	0	0
5	12	1	12	1
Total	**2,119**	**100**	**2,119**	**100**



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
Date:	17-Jan-2025
Drawn by:	JG

SLR

Drill Pad
Zone 1
Mining Leases
Mineral Development Licence (MDL) 217

Suitability Class

Cropping 4, Grazing 2 - 831 ha, 39%
Cropping 5, Grazing 3 - 1275.1 ha, 60%
Cropping 5, Grazing 5 - 12.4 ha, 1%

ENSHAM SOIL SURVEY

Cropping and Grazing Suitability Class

FIGURE 12

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_Soil_F12 Cropping Land Suitability Class.mxd

5.3 Agricultural Land Class Assessment

Agricultural land classification in Queensland follows a simple hierarchical scheme that is applicable across the state. It allows the presentation of interpreted land evaluation data to indicate the location and extent of agricultural land that can be used sustainably for a wide range of land uses with minimal land degradation. Provision is also made to highlight areas that may be suitable for one specific crop considered important in a particular area. Three broad classes of agricultural land and one non-agricultural land class are identified in the Agricultural Land Class system (DSITI & DNRM, 2015) (**Table 16**), these are:

- Class A – Crop land:
  - Class A1 – Broadacre and horticultural crops
  - Class A2 – Horticultural crops only
- Class B – Limited crop land
- Class C – Pasture (grazing) land:
  - Class C1 – Grazing sown pastures or native pastures on higher fertility soils
  - Class C2 – Grazing native pastures on with lower fertility soils than C1
  - Class C3 – light grazing of native pastures and land suited to forestry, and
- Class D – Non-agricultural land.

Table 16 Agricultural Land Classes

Class	Description
A	Crop land – Land that is suitable for current and potential crops with limitations to production which range from none to moderate levels.
A1	Suitable for a wide range of current and potential broadacre and horticultural crops.
A2	Suitable for a wide range of current and potential horticultural crops only.
B	Limited crop land – Land that is marginal for current and potential crops due to severe limitations; and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
C	Pasture land – Land that is suitable only for improved or native pastures due to limitations which preclude continuous cultivation for crop production; but some areas may tolerate a short period of ground disturbance for pasture establishment.
C1	Suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils.
C2	Suitable for grazing native pastures, with or without the introduction of pasture, and with lower fertility soils than C1.
C3	Suitable for light grazing of native pastures in accessible areas, and includes steep land more suited to forestry or catchment protection
D	Non-agricultural land – Land not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

5.4 Agricultural Land Class Results

5.4.1 Pre-Mining

The agricultural land class ratings for the Project are as follows:

- Approximately 832 ha of land associated with SMU 1A, 1B and 2B is rated as Class A2
- Approximately 1,275 ha of land associated with SMU 2A and 2C is rated as Class C2
- Approximately 12 ha of land associated with SMU 3 is rated as Class C3.

Soil wetness (W) and soil water availability (M) were the main limitations concerning the soil in the Project.

Results for the pre-mining agricultural land classes are outlined in **Table 17** and shown in **Figure 13**, with the detailed agricultural land classes provided in **Appendix E**.

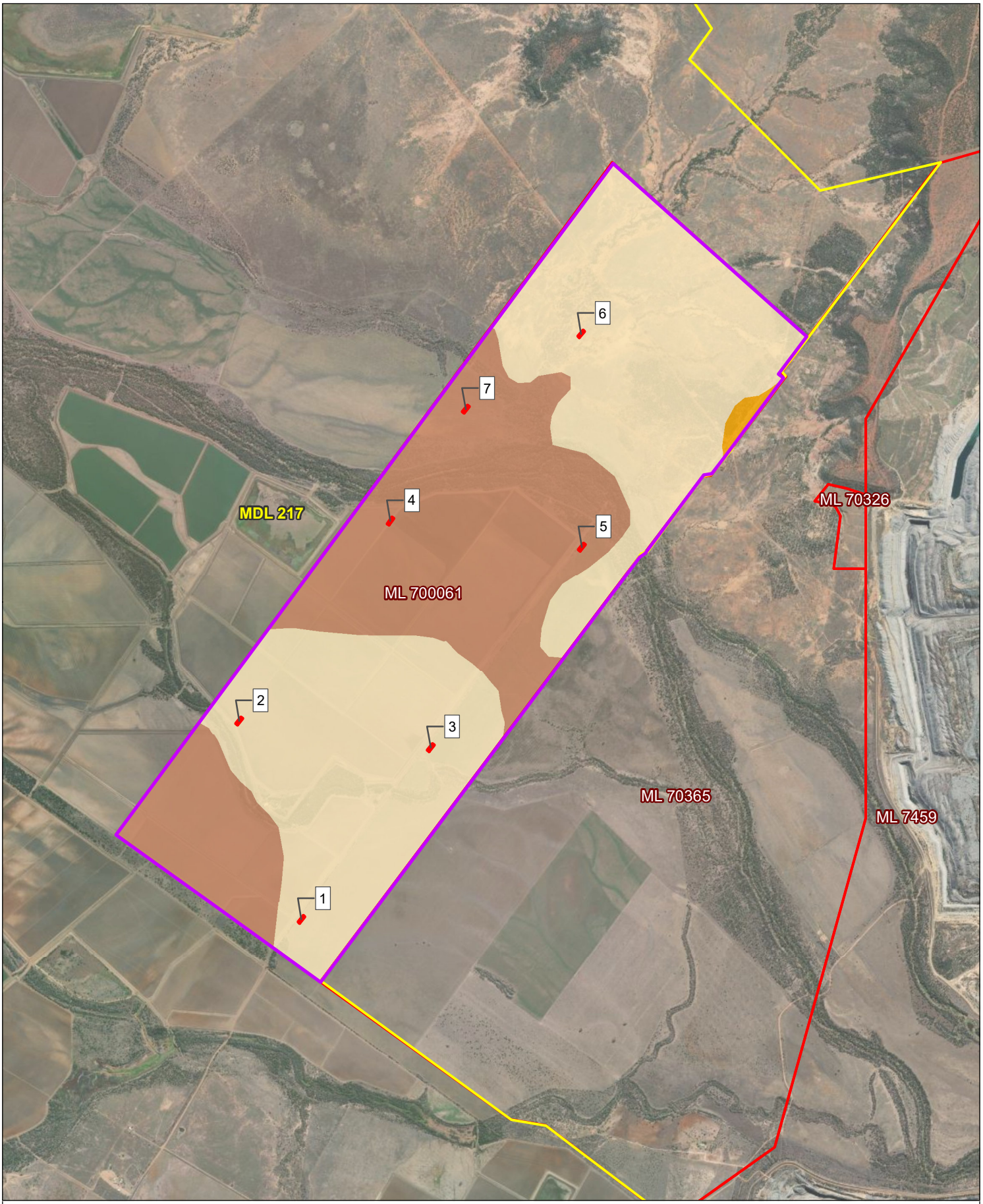
5.4.2 Post-Mining

Agricultural land classes for areas not scheduled for the proposed mining minor construction footprint (ie 7 Drill Pads) will remain the same. Surface disturbance predicted for this Project will be limited to the Drill Pad construction footprint. Upon Drill Pad decommission, these classes will remain the same post-mining.

Changes in the areas of agricultural land classes within the Project between pre- and post-mining are summarised in **Table 17**.

Table 17 Pre-and post-mining Agricultural Land Classes

Agricultural Land Class	Pre-Mining		Post-Mining	
	Ha	%	Ha	%
A1	0	0	0	0
A2	832	39	832	39
B	0	0	0	0
C1	0	0	0	0
C2	1,275	60	1,275	60
C3	12	1	12	1
D	0	0	0	0
Total	**2,119**	**100**	**2,119**	**100**



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.041251
Date:	17-Jan-2025
Drawn by:	JG

SLR

Drill Pad
Zone 1
Mining Leases
Mineral Development Licence (MDL) 217

Agricultural Land Suitability
A2 - 831 ha, 39%
C2 - 1275.1 ha, 60%
C3 - 12.4 ha, 1%

ENSHAM SOIL SURVEY

Agricultural Land Suitability

FIGURE 13

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.041251.00001 Ensham RIDA Update Zone 1\06 SLR Data\01 GIS\GIS\Soil\620041251_Soil_F13 Agricultural Land Suitability Class.mxd

6.0 Conclusions

Six Soil Map Units (SMU) were identified in the assessment, comprising of the following:

- SMU 1A Crusty Brown Vertosol (191 ha)
- SMU 1B Crusty Brown Vertosol (480 ha)
- SMU 2A Eutrophic Brown Dermosol (622 ha)
- SMU 2B Eutrophic Brown Dermosol (161 ha)
- SMU 2C Eutrophic Brown Dermosol (653 ha), and
- SMU 3 Clastic Rudosol (12 ha).

The land suitability assessment indicates:

- SMU 1A, 1B and 2B (832 ha) are rated as Class 4 (marginal land with severe limitations) for cropping and Class 2 (suitable land with minor limitations) for grazing
- SMU 2A and 2B (1,275 ha) are rated as Class 5 (unsuitable land) for cropping and Class 3 for grazing (marginal land with moderate limitations)
- SMU 3 is rated as Class 5 for cropping and grazing (12 ha), and
- The main limitations of the soil in the Project were soil wetness (W) and soil water availability (M).

The agricultural land assessment indicates:

- SMU 1A, 1B and 2B are rated as Agricultural Land Class A2 (832 ha), a wide range of crops and/or horticultural crops only
- SMU 2A and 2B are rated as Agricultural Land Class C2 (1,275 ha), grazing native pastures on with lower fertility soils than C1, and
- SMU 3 is rated as Agricultural Land Class C3 (12 ha), light grazing of native pastures and land suited to forestry.

The assessment of soil resources indicates:

- An estimated topsoil volume of 4,764,300 m^3
- An estimated subsoil volume of 16,341,700 m^3, and

The Project will rely on existing infrastructure and soil stripping will be limited to the Drill Pads which is <0.2% of the Project. The geochemical assessment of waste rock indicates:

- Confirmation of the previous waste rock assessments by URS in 2005 and 2015
- The waste rock is non-acid generating and has significant buffering capacity
- The GAI results showed very low and depleted metal concentrations. ASLP metal concentrations showed several exceedances of guideline values for aquatic ecosystem protection, particularly aluminium and vanadium. Such exceedances are unlikely at the reported pH and are likely to be the result of colloid transport through the 0.45 µm filter membrane (Brookins; 1988, Meunier; 1994)
- Waste rock produced will not be placed on agricultural land, but be buried within approved open cut pits C and D (located outside the Project area), in accordance with a Mining Waste Management Plan as per condition G2 of the EA. Laboratory results indicate impacts from metals concentration and leachability is considered unlikely

- The estimated volume of waste rock from the proposed Project over the life of the mine is 143,100 m^3 in total, which is approximately less than 0.4% of total approved waste rock volumes (36 million m^3) currently approved for the rehabilitation of open cut Pit C and Pit D. At less than 0.4% of total approved rock volume for Pit C and Pit D, it is not envisaged that this addition would impact the approved final landform outcomes shown in the Progressive Rehabilitation and Closure Plan.
- Any land use impacts associated with the Project will be managed in accordance with the individual land compensation agreements.

Existing EA conditions are considered adequate for the Project so no changes to the current EA conditions are proposed.

7.0 References

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Appendix A Detailed Profile Descriptions

Ensham Life of Mine Extension Project – Zone 1

Land Resource Assessment

Ensham Resources Pty Ltd

SLR Project No.: 620.041251.00001

31 January 2025

Appendix A

BH17

Crusty Brown Vertosol

Table 1 Summary Crusty Brown Vertosol

Overview	
Landscape SMU 1A 	
Coordinates (GDA94 Zone55)	643674 m E, 7403964 m N
ASC Name	Crusty Brown Vertosol
Representative SMU	1A
Survey Type	Detailed
Dominant Land Use	Reserve
Microrelief	Nil
Vegetation	Eucalyptus and Prickly Acacia
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Loose

Table 2 Profile: Crusty Brown Vertosol

Profile	
	
A1 0-20	Brown (10YR 4/3) light medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 7.5 field pH. Nil segregations. Sampled 0-10 cm.
B21 20-100	Black (10YR 2/1) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 8 field pH. 2-10% distinct grey mottling. <2 mm soft calcareous segregations. Sampled 20-30 cm, 50-60 cm, 90-100 cm.

BH18

Self-Mulching Grey Vertosol

Table 3 Summary Self-Mulching Grey Vertosol

Overview	
Landscape SMU 1A 	
Coordinates (GDA94 Zone55)	644694 m E, 7403554 m N
ASC Name	Self-Mulching Grey Vertosol
Representative SMU	1A
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Nil
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Loose

Table 4 Profile: Self-Mulching Grey Vertosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Dark greyish brown (10YR 4/2) light medium clay, strong structure of <2 mm subangular blocky peds with a rough fabric and weak consistence. 8.5 field pH. Nil segregations. Sampled 0-10 cm.
B21 20-100	Dark greyish brown (10YR 4/2) medium heavy clay, strong structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 8 field pH. 20-50% distinct grey and brown mottling. <2 mm soft calcareous segregations. Sampled 20-30 cm, 50-60 cm, 90-100 cm.

BH18 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	8.81	STAL	3.1	NS	55	0.22	L	3.5	M
B2	8.64	STAL	8.4	S	60	0.63	H	2.2	M

BH19

Self-Mulching Black Dermosol

Table 5 Summary Self-Mulching Black Dermosol

Overview	
Landscape SMU 2A 	
Coordinates (GDA94 Zone55)	6444340 m E, 7405227 m N
ASC Name	Self-Mulching Black Dermosol
Representative SMU	2A
Survey Type	Detailed
Dominant Land Use	Reserve
Microrelief	Nil
Vegetation	Brigalow
Slope (%)	5%
Slope Method	Clinometer
Surface Condition	Self-mulching

Table 6 Profile: Self-Mulching Black Dermosol

Profile	
	
Horizon / Depth (cm)	**Description**
A1 0-30	Very dark brown (10YR 2/2) light clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 6.5 field pH. 2-10% faint orange mottling. Nil segregations. Sampled 0-10 cm, 20-30 cm.
B21 30-70	Very dark greyish brown (10YR 3/2) light clay, strong structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 8 field pH. 10-20% distinct grey mottling. Nil segregations. Sampled 50-60 cm.

Profile	
B22 70-100	Dark brown (10YR 3/3) light clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 7.5 field pH. 10-20% distinct grey & orange mottling. Nil segregations. Sampled 90-100 cm.

BH20

Self-Mulching Black Dermosol

Table 7 Summary Self-Mulching Black Dermosol

Overview	
Landscape SMU 2A	
	
Coordinates (GDA94 Zone55)	645523 m E, 7403427 m N
ASC Name	Self-Mulching Black Dermosol
Representative SMU	2A
Survey Type	Detailed
Dominant Land Use	Other
Microrelief	Nil

Overview	
Vegetation	Eucalyptus
Slope (%)	1%
Slope Method	Clinometer
Surface Condition	Loose

Table 8 Profile: Self-Mulching Black Dermosol

Profile	
	
Horizon / Depth (cm)	**Description**
A1 0-10	Dark greyish brown (10YR 4/2) light clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 9 field pH. <2% faint brown mottling. 2-6 mm fragment size (fine gravel). Nil segregations. Sampled 0-10 cm.
B21 10-80	Very dark brown (10YR 2/2) light medium clay, strong structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 7.5 field pH. 2-10% distinct red mottling. 2-6 mm fragment size (fine gravel). Nil segregations. Sampled 20-30 cm, 50-60 cm.

Profile	
B22 80-100	Dark brown (10YR 3/4) medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 7.5 field pH. 2-6 mm fragment size (fine gravel). Nil segregations. Sampled 90-100 cm.

BH21

Self-Mulching Black Dermosol

Table 9 Summary Self-Mulching Black Dermosol

Overview	
Landscape SMU 2A 	
Coordinates (GDA94 Zone55)	645827 m E, 7404597 m N
ASC Name	Self-Mulching Black Dermosol
Representative SMU	2A
Survey Type	Detailed
Dominant Land Use	Reserve
Microrelief	Nil
Vegetation	Brigalow
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Surface cracking

Table 10 Profile: Self-Mulching Black Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Very dark greyish brown (10YR 3/2) light medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 8 field pH. Nil segregations. Sampled 0-10 cm.
B21 20-50	Very dark greyish brown (10YR 3/2) medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8.5 field pH. Nil segregations. Sampled 20-30, 50-60 cm.

Profile	
B22 50-100	Dark brown (10YR 3/3) medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and strong consistence. 8 field pH. 2-10% faint grey mottling. Nil segregations. Sampled 70-80 cm, 90-100 cm.

BH22

Eutrophic Black Dermosol

Table 11 Summary Eutrophic Black Dermosol

Overview	
Landscape SMU 2A 	
Coordinates (GDA94 Zone55)	645130 m E, 7405681 m N
ASC Name	Eutrophic Black Dermosol
Representative Site	2A
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Nil
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Loose

Table 12 Profile: Eutrophic Black Dermosol

Profile

Horizon / Depth (cm)	Description
B21 0-70	Dark brown (7.5YR 3/2) medium heavy clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 8 field pH. Nil segregations. Sampled 0-10 cm, 20-30 cm, 50-60 cm.
B22 70-100	Dark brown (7.5YR 3/2) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 7.5 field pH. Calcareous segregations. Sampled 90-100 cm.

BH22 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
B21	8.66	STAL	7.3	S	64	0.51	M	2.9	M
B22	8.74	STAL	11.8	S	60	0.35	M	1.8	L

BH23

Eutrophic Black Vertosol

Table 13 Summary Eutrophic Black Vertosol

Overview	
Landscape SMU 1B 	
Coordinates (GDA94 Zone55)	645600 m E, 7406293 m N
ASC Name	Eutrophic Black Vertosol
Representative SMU	1B
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Nil
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Loose

Table 14 Profile: Eutrophic Black Vertosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Very dark greyish brown (10YR 3/2) medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 9 field pH. 2-10% faint brown mottling Nil segregations. Sampled 0-10 cm.
B21 20-50	Very dark grey (10YR 3/1) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8 field pH. Nil segregations. Sampled 20-30 cm.
B22 50-100	Very dark grey (10YR 3/1) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 9 field pH. Nil segregations. Sampled 50-60 cm, 90-100 cm.

BH24

Eutrophic Grey Vertosol

Table 15 Summary Eutrophic Grey Vertosol

Overview	
Landscape SMU 1B 	
Coordinates (GDA94 Zone55)	646459 m E, 7406143 m N
ASC Name	Eutrophic Grey Vertosol
Representative SMU	1B
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Crops
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Surface crust

Table 16 Profile: Eutrophic Grey Vertosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Dark greyish brown (10YR 4/2) light medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 8.5 field pH. <2 mm soft calcareous segregations. Sampled 0-10 cm.
B21 20-100	Very dark greyish brown (10YR 3/2) medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8 field pH. 10-20% faint grey and brown mottling. Nil segregations. Sampled 20-30 cm, 50-60 cm, 90-100 cm

BH25

Eutrophic Brown Dermosol

Table 17 Summary Eutrophic Brown Dermosol

Overview	
Landscape SMU 2B 	
Coordinates (GDA94 Zone55)	647186 m E, 7407072 m N
ASC Name	Eutrophic Brown Dermosol
Representative SMU	2B
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Crops
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Soft

Table 18 Profile: Eutrophic Brown Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-10	Very dark greyish brown (10YR 3/2) light clay, weak structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 2-6 mm gravel fragments. 8 field pH. 2-10% distinct grey mottling. Nil segregations. Sampled 0-10 cm.
B21 10-25	Dark brown (10YR 3/3) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8 field pH. 20-50% distinct grey mottling. < 2 mm soft calcareous segregations. Sampled 20-30 cm.
B22 25-60	Dark yellowish brown (10YR 3/4) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8 field pH. 20-50% distinct grey mottling. Nil segregations. Sampled 20-30 cm, 50-60 cm.
B23 60-100	Dark yellowish brown (10YR 4/4) medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 8 field pH. 10-20% faint brown mottling. Nil segregations. Sampled 90-100 cm.

BH26

Eutrophic Brown Dermosol

Table 19 Summary Eutrophic Brown Dermosol

Overview	
Landscape SMU 2B 	
Coordinates (GDA94 Zone55)	646136 m E, 7407001 m N
ASC Name	Eutrophic Brown Dermosol
Representative SMU	2B
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Crops
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Soft

Table 20 Profile: Eutrophic Brown Dermosol

Profile


Horizon/Depth (cm)	Description
A1 0-10	Very dark brown (10YR 2/2) light clay, weak structure of <2 mm angular blocky peds with a rough fabric and weak consistence. 8.5 field pH. 20-50% distinct brown mottling. Nil segregations. Sampled 0-10 cm.
B21 10-30	Very dark greyish brown (10YR 3/3) medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 7.5 field pH. 20-50% distinct grey mottling. Nil segregations. Sampled 20-30 cm.
B22 30-65	Dark yellowish brown (10YR 4/4) light medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 8 field pH. 20-50% distinct grey mottling. Nil segregations. Sampled 50-60 cm.
B23 65-100	Yellowish brown (10YR 5/6) light clay, weak structure of <2 mm subangular blocky peds with a rough fabric and weak consistence. 7.5 field pH. 10-20% faint grey mottling. Nil segregations. Sampled 90-100 cm.

BH26 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	8.49	STAL	1.22	NS	43	0.08	VL	3.41	M
B21	8.14	MAL	6.58	S	51	0.33	M	2.74	M

BH26 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
B22	8.90	STAL	7.11	S	52	0.30	M	2.26	M
B23	9.17	VSAL	7.83	S	31	0.23	M	2.29	M

BH27

Eutrophic Black Dermosol

Table 21 Summary Eutrophic Black Dermosol

Overview	
Landscape SMU 2A 	
Coordinates (GDA94 Zone55)	646959 m E, 7405302 m N
ASC Name	Eutrophic Black Dermosol
Representative SMU	2A
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Cropping
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Soft

Table 22 Profile: Eutrophic Black Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Very dark brown (10YR 2/2) medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and weak consistence. 8 field pH. 2-10% distinct red mottling. Nil segregations. Sampled 0-10 cm.
A2 20-40	Dark brown (10YR 3/3) light medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and weak consistence. 8.5 field pH. Nil segregations. Sampled 20-30 cm.
B21 40-60	Very dark brown (10YR 2/2) medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 8.5 field pH. Nil segregations. Sampled 50-60 cm.
B22 60-90	Very dark brown (10YR 2/2) medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 8 field pH. 10-20% faint grey mottling. <2 mm soft calcareous segregations. Sampled 50-60 cm.
B23 90-100	Dark yellowish brown (10YR 3/4) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 7.5 field pH. 20-50% distinct grey mottling. Nil segregations. Sampled 90-100 cm.

BH28

Eutrophic Brown Vertosol

Table 23 Summary Eutrophic Brown Vertosol

Overview	
Landscape SMU 1B 	
Coordinates (GDA94 Zone55)	648044 m E, 7406838 m N
ASC Name	Eutrophic Brown Vertosol
Representative SMU	1B
Survey Type	Detailed
Dominant Land Use	Cropping
Microrelief	Nil
Vegetation	Crops
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Soft

Table 24 Profile: Eutrophic Brown Vertosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Black (7.5YR 2.5/1) medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 7.5 field pH. Nil segregations. Sampled 0-10 cm.
A2 20-50	Very dark grey (5YR 3/1) medium heavy clay, strong structure of 2-5 mm angular blocky peds with a rough fabric and strong consistence. 8 field pH. 2-10% brown mottling. <2 mm soft calcareous segregations. Sampled 20-30 cm.
B21 50-80	Very dark brown (7.5YR 2.5/2) medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and strong consistence. 8 field pH. 20-50% faint brown mottling. Nil segregations. Sampled 50-60 cm.
B22 80-100	Dark brown (7.5YR 3/4) light medium clay, strong structure of <2 mm cast peds with a rough fabric and very firm consistence. 8 field pH. 10-20% distinct grey mottling. <2 mm soft calcareous segregations. Sampled 90-100 cm.

BH29

Crusty Black Vertosol

Table 25 Summary Crust Black Vertosol

Overview	
Landscape SMU 1B 	
Coordinates (GDA94 Zone55)	648044 m E, 7406839 m N
ASC Name	Crusty Black Vertosol
Representative SMU	1B
Survey Type	Detailed
Dominant Land Use	Reserve
Microrelief	Nil
Vegetation	Eucalyptus
Slope (%)	2%
Slope Method	Clinometer
Surface Condition	Loose

Table 26 Profile: Crusty Black Vertosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Very dark greyish brown (10YR 3/2) light clay, moderate structure of <2 mm polyhedral peds with a rough fabric and weak consistence. 7 field pH. Nil segregations. Sampled 0-10 cm.
B21 20-40	Very dark brown (10YR 2/2) light medium clay, moderate structure of <2 mm polyhedral peds with a rough fabric and weak consistence. 7.5 field pH. Nil segregations. Sampled 20-30 cm.
B22 40-85	Very dark grey (10YR 3/1) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8 field pH. Nil segregations. Sampled 50-60 cm.

Profile	
B23 85-100	Very dark greyish brown (10YR 3/2) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 8 field pH. Nil segregations. Sampled 90-100 cm.

BH29 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	7.76	SLAL	0.64	NS	51	0.08	VL	2.66	M
B21	8.19	MAL	0.95	NS	39	0.10	L	2.91	M
B22	8.28	MAL	1.08	NS	39	0.08	VL	2.72	M
B23	8.34	MAL	1.07	NS	39	0.07	VL	2.73	M

BH30

Eutrophic Brown Dermosol

Table 27 Summary Eutrophic Brown Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	648961 m E, 7407381 m N
ASC Name	Eutrophic Brown Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Grazing
Microrelief	Nil
Vegetation	Brigalow
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Firm

Table 28 Profile: Eutrophic Brown Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-30	Brown (10YR 3/2) light clay, moderate structure of <2 mm polyhedral peds with a rough fabric and strong consistence. 6-20 mm fragment size (medium gravel). 7 field pH. 20-50% faint brown mottling. Nil segregations. Sampled 0-10, 20-30 cm.

Profile	
A2 30-50	Brown (10YR 5/3) sandy clay loam, strong structure of <2 mm angular blocky peds with a smooth fabric and very strong consistence. 8 field pH. 10-20% faint orange mottling. Nil segregations.
B21 50-80	Light olive brown (2.5YR 5/4) clay loam, strong structure of <2 mm angular blocky peds with a rough fabric and very strong consistence. 6-20 mm fragment size (medium gravel). 8 field pH. 20-50% distinct grey mottling. Nil segregations. Sampled 50-60 cm.
C 80-200	Weathering parent material.
D 200-240	Parent material.

BH30 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	7.64	SLAL	0.92	NS	29	0.02	VL	2.04	M
B21	8.49	STAL	1.15	NS	20	0.07	L	1.51	L

BH31

Eutrophic Brown Dermosol

Table 29 Summary Eutrophic Brown Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	647564 m E, 7408988 m N
ASC Name	Eutrophic Brown Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Grazing
Microrelief	Nil
Vegetation	Pasture
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Firm

Table 30 Profile: Eutrophic Brown Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-35	Dark yellowish brown (10YR 3/4) light medium clay, weak structure of <2 mm subangular blocky peds with a rough fabric and weak consistence. 7 field pH. 2-10% faint brown mottling. Nil segregations. Sampled 0-10 cm.
B21 35-75	Strong brown (7.5YR 4/6) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and very strong consistence. 7.5 field pH. 10-20% faint brown mottling. Soft calcareous segregations. Sampled 20-30 cm, 50-60 cm.
B22 75-100	Strong brown (7.5YR 5/6) medium clay, strong structure of 2-5 mm angular blocky peds with a rough fabric and strong consistence. 8 field pH. 10-20% distinct brown mottling. 2-10 mm Ferromanganiferous nodule segregations. Sampled 90-100 cm.

BH32

Mesotrophic Red Dermosol

Table 31 Summary Mesotrophic Red Dermosol

Overview	
Landscape SMU 2C	
	
Coordinates (GDA94 Zone55)	647862 m E, 7409618 m N
ASC Name	Mesotrophic Red Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Grazing
Microrelief	Nil
Vegetation	Pasture
Slope (%)	1%
Slope Method	Clinometer
Surface Condition	Loose

Table 32 Profile: Mesotrophic Red Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-15	Dark reddish brown (5YR 3/4) sandy clay loam, weak structure of <2 mm polyhedral peds with a rough fabric and weak consistence. 7 field pH. Nil segregations. Sampled 0-10 cm.
A2 15-50	Reddish brown (5YR 4/4) light clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 7.5 field pH. 2-10% faint brown mottling. Nil segregations. Sampled 20-30 cm.
B21 50-100	Yellowish red (5YR 4/6) sandy clay loam, moderate structure of <2 mm angular blocky peds with a rough fabric and very strong consistence. 8 field pH. Nil segregations. Sampled 50-60 cm, 90-100 cm.

BH32 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	7.02	NEU	1.11	NS	13	0.03	VL	4.68	H
A2	7.39	SLAL	1.12	NS	13	0.03	VL	5.68	H

BH32 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
B2	8.63	STAL	2.28	NS	30	0.11	L	3.94	M

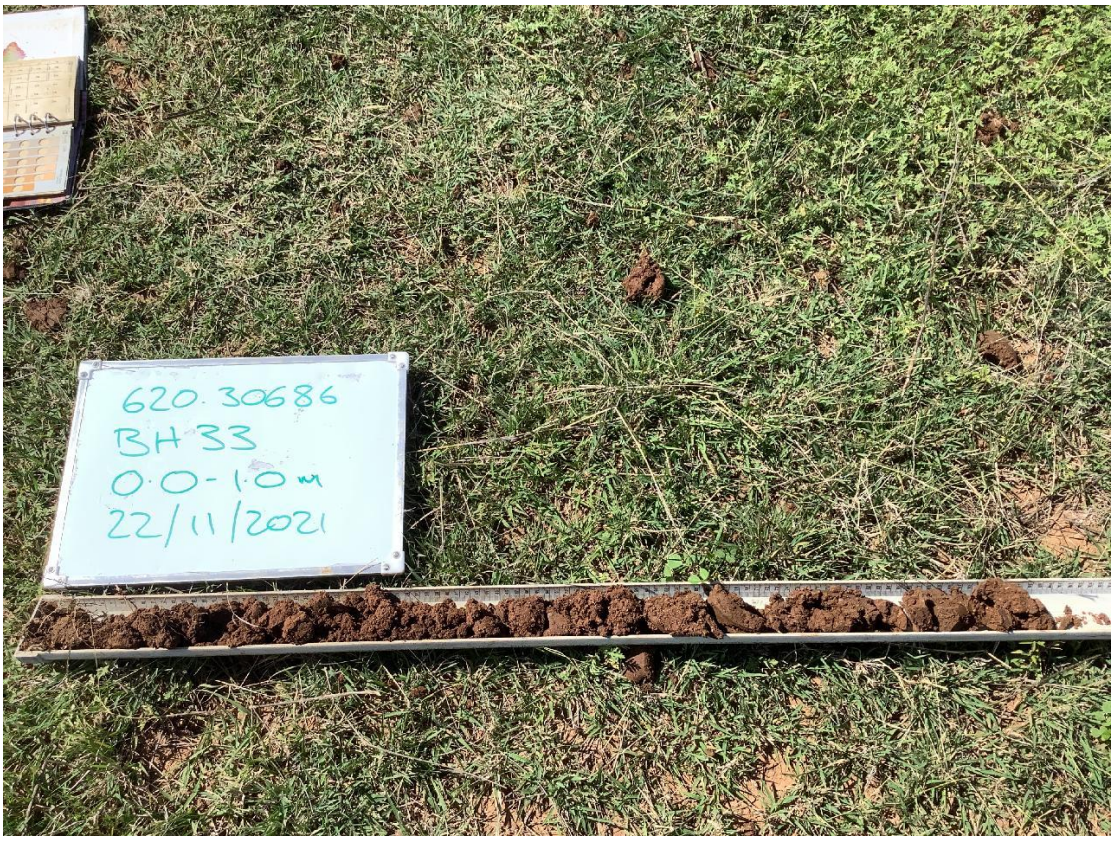
BH33

Mesotrophic Red Dermosol

Table 33 Summary Mesotrophic Red Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	648416 m E, 7410346 m N
ASC Name	Mesotrophic Red Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Pasture
Microrelief	Gilgai
Vegetation	Pasture
Slope (%)	2%
Slope Method	Clinometer
Surface Condition	Surface cracking

Table 34 Profile: Mesotrophic Red Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Dark yellowish brown (10YR 3/4) light medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 7.5 field pH. 10-20% faint grey mottling. Nil segregations. Sampled 0-10 cm.
B21 20-40	Reddish brown (5YR 4/4) light medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 8 field pH. 2-6 mm fragment size (fine gravel). 2-10% faint brown mottling. Nil segregations. Sampled 20-30 cm.
B22 40-60	Dark brown (7.5YR 3/4) medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 7.5 field pH. 2-6 mm fragment size (fine gravel). 10-20% faint brown mottling. 2-6 mm soft calcareous segregations. Sampled 50-60 cm.
B23 60-100	Dark yellowish brown (10YR 4/4) medium heavy clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 8 field pH. 2-6 mm fragment size (fine gravel). 20-50% distinct grey and orange mottling. <2 mm soft calcareous segregations. Sampled 90-100 cm.

BH34

Eutrophic Brown Dermosol

Table 35 Summary Eutrophic Brown Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	649910 m E, 7408986 m N
ASC Name	Eutrophic Brown Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Grazing
Microrelief	Nil
Vegetation	Brigalow
Slope (%)	2%
Slope Method	Clinometer
Surface Condition	Firm

Table 36 Profile: Eutrophic Brown Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Dark brown (10YR 3/3) medium clay, moderate structure of 2-5 mm angular blocky peds with a porous fabric and very firm consistence. 6 field pH. 10-20% faint grey mottling. Nil segregations. Sampled 0-10 cm.
B21 20-50	Dark brown (7.5YR 3/3) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and strong consistence. 6 field pH. 10-20% faint orange mottling. Nil segregations. Sampled 20-30 cm.

Profile	
B22 50-90	Dark yellowish brown (10YR 4/4) medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and strong consistence. 6.5 field pH. 10-20% distinct red, orange and grey mottling. Nil segregations. Sampled 50-60 cm.
B23 90-100	Strong brown (7.5YR 4/6) clay loam, sandy, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 8 field pH. 2-6 mm fragment size (fine gravel). 20-50% distinct brown, orange, grey and red mottling. Nil segregations. Sampled 90-100 cm.

BH34 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	5.97	MAC	15.10	SS	24	0.91	VH	1.41	L
B21	6.05	MAC	22.25	SS	43	1.13	VH	0.94	VL
B22	8.17	MAL	24.63	SS	38	0.34	M	0.62	VL
B23	8.60	STAL	27.31	SS	18	0.23	M	0.53	VL

BH35

Eutrophic Brown Dermosol

Table 37 Summary Eutrophic Brown Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	649663 m E, 7409433 m N
ASC Name	Eutrophic Brown Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Grazing
Microrelief	Nil
Vegetation	Pasture
Slope (%)	2%
Slope Method	Clinometer
Surface Condition	Soft

Table 38 Profile: Eutrophic Brown Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Dark brown (7.5YR 3/4) light medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 6 field pH. 6-20mm fragment size (medium gravel). Nil segregations. Sampled 0-10 cm.
A2 20-50	Dark brown (10YR 3/3) medium heavy clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 6.5 field pH. 10-20% faint grey mottling. Nil segregations. Sampled 20-30 cm.
B21 50-100	Dark yellowish brown (10YR 4/6) medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 7.5 field pH. 20-50% faint brown and grey mottling. Nil segregations. Sampled 50-60 cm, 90-100 cm.

BH36

Mesotrophic Brown Dermosol

Table 39 Summary Mesotrophic Brown Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	648588 m E, 7409789 m N
ASC Name	Mesotrophic Brown Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Grazing
Microrelief	Nil
Vegetation	Pasture
Slope (%)	2%
Slope Method	Clinometer
Surface Condition	Hard setting

Table 40 Profile: Mesotrophic Brown Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-10	Strong brown (7.5YR 4/6) clay loam, weak structure of <2 mm subangular blocky peds with a rough fabric and weak consistence. 6.5 field pH. Nil segregations. Sampled 0-10 cm.
A2 10-45	Strong brown (7.5YR 4/6) light clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and very firm setting consistence. 7 field pH. 20-50% faint brown mottling. Nil segregations. Sampled 20-30 cm.

Profile	
B21 45-70	Strong brown (7.5YR 4/6) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and very strong consistence. 5.5 field pH. 2-10% distinct yellow mottling. Nil segregations. Sampled 50-60 cm.
B22 70-100	Yellowish red (5YR 4/6) clay loam (sandy), strong structure of <2 mm angular blocky peds with a rough fabric and very strong consistence. 6 field pH. 20-50% red, orange and grey distinct mottling. Nil segregations. Sampled 90-100 cm.

BH36 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	7.14	NEU	0.67	NS	16	0.04	VL	10.02	EH
A2	7.17	NEU	0.94	NS	23	0.03	VL	5.93	H
B21	5.88	MAC	3.04	NS	50	0.05	VL	1.88	L
B22	6.66	NEU	8.38	S	46	0.09	VL	1.35	L

BH37

Mesotrophic Brown Dermosol

Table 41 Summary Mesotrophic Brown Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	648404 m E, 7408986 m N
ASC Name	Mesotrophic Brown Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Reserve
Microrelief	Nil
Vegetation	Brigalow
Slope (%)	2%
Slope Method	Clinometer
Surface Condition	Hard setting

Table 42 Profile: Mesotrophic Brown Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-25	Yellowish red (5YR 4/6) light medium clay, moderate structure of <2 mm angular blocky peds with a rough fabric and firm setting consistence. 6 field pH. 2-6 mm ferricrete fragments. 10-20% faint red mottling. Nil segregations. Sampled 0-10 cm.

Profile	
A2 25-70	Strong brown (7.5YR 5/8) light medium clay, strong structure of 2-5 mm angular blocky peds with a rough fabric and very firm consistence. 7.5 field pH. 10-20% faint grey and orange mottling. Nil segregations. Sampled 25-35 cm, 50-60 cm.
B21 70-100	Yellowish red (5YR 4/6) medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and strong consistence. 8.5 field pH. 6-20 mm fragment size (medium gravel). 20-50% distinct mottling. Nil segregations. Sampled 90-100 cm.
B22 100-120	Strong brown (7.5YR 5/8) light medium clay, strong structure of <2 mm subangular blocky peds with a rough fabric and strong consistence. 8 field pH. 6-20 mm fragment size (medium gravel). 20-50% distinct mottling. 6-20 mm soft calcareous segregations.

BH38

Mesotrophic Red Dermosol

Table 43 Summary Mesotrophic Red Dermosol

Overview	
Landscape SMU 2C 	
Coordinates (GDA94 Zone55)	649363 m E, 7408346 m N
ASC Name	Mesotrophic Red Dermosol
Representative SMU	2C
Survey Type	Detailed
Dominant Land Use	Reserve
Microrelief	Nil
Vegetation	Brigalow
Slope (%)	5%
Slope Method	Clinometer
Surface Condition	Hard setting

Table 44 Profile: Mesotrophic Red Dermosol

Profile


Horizon / Depth (cm)	Description
A1 0-10	Strong brown (7.5YR 4/6) light clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 6 field pH. 2-6 mm fragment size (fine gravel). Nil segregations. Sampled 0-10 cm.
B21 10-40	Yellowish red (5YR 4/6) light medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and firm consistence. 5.5 field pH. 2-6 mm fragment size (fine gravel). Nil segregations. Sampled 20-30 cm.

Profile	
B22 40-70	Yellowish red (5YR 5/6) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 5.5 field pH. Nil segregations. Sampled 50-60 cm.
B23 70-100	Strong brown (7.5YR 5/8) light medium clay, strong structure of <2 mm angular blocky peds with a rough fabric and firm consistence. 5.5 field pH. 20-50% faint orange mottling. Nil segregations. Sampled 90-100 cm.

BH38 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	5.63	MAC	7.39	S	36	0.32	M	0.43	VL
B21	4.96	VSAC	17.71	SS	43	0.64	H	0.13	VL
B22	4.58	VSAC	27.90	SS	57	0.85	H	0.02	EL
B23	4.63	VSAC	33.97	SS	49	0.94	H	0.01	EL

BH39

Crusty Black Vertosol

Table 45 Summary Crusty Black Vertosol

Overview	
Landscape SMU 1B 	
Coordinates (GDA94 Zone55)	646696 m E, 7408312 m N
ASC Name	Crusty Black Vertosol
Representative SMU	1B
Survey Type	Detailed
Dominant Land Use	Other
Microrelief	Gilgai
Vegetation	Eucalyptus
Slope (%)	<1%
Slope Method	Clinometer
Surface Condition	Surface cracking

Table 46 Profile: Crusty Black Vertosol

Profile


Horizon / Depth (cm)	Description
A1 0-20	Black (10YR 2/1) light medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and weak consistence. 8 field pH. 2-6 mm fragment size (fine gravel). Nil segregations. Sampled 0-10 cm.
A2 20-45	Black (10YR 2/1) medium clay, moderate structure of <2 mm subangular blocky peds with a rough fabric and very firm consistence. 7.5 field pH. <2% light brown mottling. <2 mm soft calcareous segregations. Sampled 20-30 cm.

Profile	
B21 45-85	Very dark grey (10YR 3/1) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8 field pH. <2 mm soft calcareous segregations. Sampled 50-60 cm.
B22 85-100	Very dark grey (10YR 3/1) medium heavy clay, strong structure of <2 mm angular blocky peds with a rough fabric and very firm consistence. 8 field pH. 20-50% faint grey and brown mottling. Nil segregations. Sampled 90-100 cm.

BH39 Horizon	pH (1:5 water)		ESP		ECe			Ca:Mg	
	Unit	Rating	%	Rating	Clay %	dS/m	Rating	Ratio	Rating
A1	8.74	STAL	2.83	NS	59	0.13	L	3.37	M
A2	8.70	STAL	5.67	NS	60	0.21	L	2.80	M
B21	8.66	STAL	8.83	S	58	0.38	M	2.44	M
B22	8.62	STAL	12.28	S	51	0.67	H	2.23	M

Appendix B Check Site Descriptions

Ensham Life of Mine Extension Project – Zone 1

Land Resource Assessment

Ensham Resources Pty Ltd

SLR Project No.: 620.041251.00001

31 January 2025

Appendix B

Brown Vertosol

Table 1: Summary: Brown Vertosol (Check Site 27)

Overview		
Coordinates (GDA94 Zone55)	644743 m E, 7403219 m N	
ASC Name	Brown Vertosol	
Representative Site	CH27	
Soil Map Unit	1A	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Reserve	
Vegetation	Eucalyptus	
Slope (%)	<1%	
Slope Type	Flat	

Brown Vertosol

Table 1 Summary: Brown Vertosol (Check Site 28)

Overview		
Coordinates (GDA94 Zone55)	644088 m E, 7404571 m N	
ASC Name	Brown Vertosol	
Representative Site	CH28	
Soil Map Unit	1A	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Cropping	
Vegetation	Nil	
Slope (%)	<1%	
Slope Type	Flat	

Brown Vertosol

Table 2 Summary: Brown Vertosol (Check Site 29)

Overview		
Coordinates (GDA94 Zone55)	644791 m E, 7404375 m N	
ASC Name	Brown Vertosol	
Representative Site	CH29	
Soil Map Unit	1A	
Survey Type	Check site	
Dominant Topography	Closed Depression	
Dominant Land Use	Reserve	
Vegetation	Eucalyptus	
Slope (%)	<1%	
Slope Type	Closed depression	

Brown Vertosol

Table 3 Summary: Brown Vertosol (Check Site 30)

Overview		
Coordinates (GDA94 Zone55)	644768 m E, 7404371 m N	
ASC Name	Brown Vertosol	
Representative Site	CH30	
Soil Map Unit	1A	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Cropping	
Vegetation	Nil	
Slope (%)	<1%	
Slope Type	Flat	

Brown Dermosol

Table 4 Summary: Dermosol (Check Site 31)

Overview		
Coordinates (GDA94 Zone55)	645488 m E, 7403460 m N	
ASC Name	Brown Dermosol	
Representative Site	CH31	
Soil Map Unit	2A	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Cropping	
Vegetation	Nil	
Slope (%)	<1%	
Slope Type	Flat	

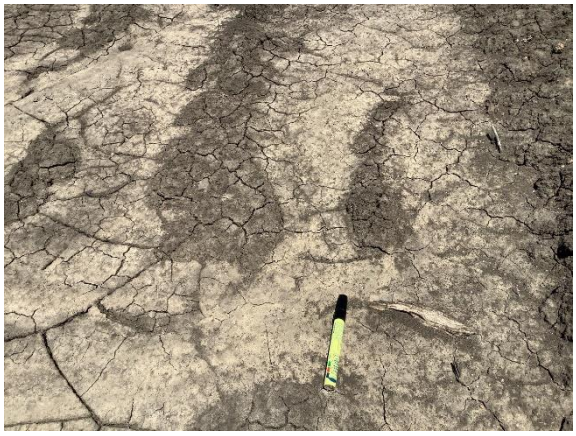
Brown Dermosol

Table 5 Summary: Brown Dermosol (Check Site 32)

Overview		
Coordinates (GDA94 Zone55)	645937 m E, 7404405 m N	
ASC Name	Brown Dermosol	
Representative Site	CH32	
Soil Map Unit	2A	
Survey Type	Check site	
Dominant Topography	Undulating rises	
Dominant Land Use	Reserve	
Vegetation	Eucalyptus	
Slope (%)	3-10%	
Slope Type	Upper slope	

Brown Dermosol

Table 6 Summary: Brown Dermosol (Check Site 33)

Overview		
Coordinates (GDA94 Zone55)	645928 m E, 7404358 m N	
ASC Name	Brown Dermosol	
Representative Site	CH33	
Soil Map Unit	2A	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Cropping	
Vegetation	Nil	
Slope (%)	<1%	
Slope Type	Flat	

Brown Dermosol

Table 7 Summary: Brown Dermosol (Check Site 34)

Overview		
Coordinates (GDA94 Zone55)	644756 m E, 7404770 m N	
ASC Name	Brown Dermosol	
Representative Site	CH34	
Soil Map Unit	2A	
Survey Type	Check site	
Dominant Topography	Closed depression	
Dominant Land Use	Reserve	
Vegetation	Brigalow	
Slope (%)	3-10%	
Slope Type	Closed depression	

Brown Dermosol

Table 8 Summary: Brown Dermosol (Check Site 35)

Overview		
Coordinates (GDA94 Zone55)	646923 m E, 7407489 m N	
ASC Name	Brown Dermosol	
Representative Site	CH35	
Soil Map Unit	2B	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Reserve	
Vegetation	Eucalyptus	
Slope (%)	<1%	
Slope Type	Upper slope	

Brown Dermosol

Table 9 Summary: Brown Dermosol (Check Site 36)

Overview		
Coordinates (GDA94 Zone55)	646467 m E, 7407369 m N	
ASC Name	Brown Dermosol	
Representative Site	CH36	
Soil Map Unit	2B	
Survey Type	Check site	
Dominant Topography	Upper slope	
Dominant Land Use	Reserve	
Vegetation	Eucalyptus	
Slope (%)	1-3%	
Slope Type	Upper slope	

Brown Dermosol

Table 10 Summary: Brown Dermosol (Check Site 37)

Overview		
Coordinates (GDA94 Zone55)	646426 m E, 7404651 m N	
ASC Name	Brown Dermosol	
Representative Site	CH37	
Soil Map Unit	2A	
Survey Type	Check site	
Dominant Topography	Alluvial plain	
Dominant Land Use	Reserve	
Vegetation	Other	
Slope (%)	<1%	
Slope Type	Flat	

Brown Vertosol

Table 11 Summary: Brown Vertosol (Check Site 38)

Overview		
Coordinates (GDA94 Zone55)	647326 m E, 7405813 m N	
ASC Name	Brown Vertosol	
Representative Site	CH38	
Soil Map Unit	1B	
Survey Type	Check site	
Dominant Topography	Alluvial plain	
Dominant Land Use	Other	
Vegetation	Other	
Slope (%)	<1%	
Slope Type	Flat	

Brown Vertosol

Table 12 Summary: Brown Vertosol (Check Site 39)

Overview		
Coordinates (GDA94 Zone55)	647486 m E, 7406054 m N	
ASC Name	Brown Vertosol	
Representative Site	CH39	
Soil Map Unit	1B	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Reserve	
Vegetation	Other	
Slope (%)	<1%	
Slope Type	Flat	

Brown Vertosol

Table 13 Summary: Brown Vertosol (Check Site 40)

Overview		
Coordinates (GDA94 Zone55)	648150 m E, 7407077 m N	
ASC Name	Brown Vertosol	
Representative Site	CH40	
Soil Map Unit	1B	
Survey Type	Check site	
Dominant Topography	Upper slope	
Dominant Land Use	Reserve	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Upper slope	

Brown Vertosol

Table 14 Summary: Brown Vertosol (Check Site 41)

Overview		
Coordinates (GDA94 Zone55)	647944 m E, 7407697 m N	
ASC Name	Brown Vertosol	
Representative Site	CH41	
Soil Map Unit	1B	
Survey Type	Check site	
Dominant Topography	Crest	
Dominant Land Use	Reserve	
Vegetation	Eucalyptus	
Slope (%)	35-56%	
Slope Type	Crest	

Brown Dermosol

Table 15 Summary: Brown Dermosol (Check Site 42)

Overview		
Coordinates (GDA94 Zone55)	649492 m E, 7407798 m N	
ASC Name	Brown Dermosol	
Representative Site	CH42	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Eucalyptus	
Slope (%)	3-10%	
Slope Type	Mid slope	

Brown Dermosol

Table 16 Summary: Brown Dermosol (Check Site 43)

Overview		
Coordinates (GDA94 Zone55)	649179 m E, 7407489 m N	
ASC Name	Brown Dermosol	
Representative Site	CH43	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Lower slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Lower slope	

Brown Dermosol

Table 17 Summary: Brown Dermosol (Check Site 44)

Overview		
Coordinates (GDA94 Zone55)	648898 m E, 7407262 m N	
ASC Name	Brown Dermosol	
Representative Site	CH44	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Closed depression	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	3-10%	
Slope Type	Closed depression	

Brown Dermosol

Table 18 Summary: Brown Dermosol (Check Site 45)

Overview		
Coordinates (GDA94 Zone55)	648950 m E, 7407286 m N	
ASC Name	Brown Dermosol	
Representative Site	CH45	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	3-10%	
Slope Type	Lower slope	

Brown Dermosol

Table 19 Summary: Brown Dermosol (Check Site 46)

Overview		
Coordinates (GDA94 Zone55)	648935 m E, 7407518 m N	
ASC Name	Brown Dermosol	
Representative Site	CH46	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Mid slope	

Brown Dermosol

Table 20 Summary: Brown Dermosol (Check Site 47)

Overview		
Coordinates (GDA94 Zone55)	648765 m E, 7407501 m N	
ASC Name	Brown Dermosol	
Representative Site	CH47	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Lower slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	3-10%	
Slope Type	Lower slope	

Brown Dermosol

Table 21 Summary: Brown Dermosol (Check Site 48)

Overview		
Coordinates (GDA94 Zone55)	648558 m E, 7407704 m N	
ASC Name	Brown Dermosol	
Representative Site	CH48	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid-slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	3-10%	
Slope Type	Mid-slope	

Brown Dermosol

Table 22 Summary: Brown Dermosol (Check Site 49)

Overview		
Coordinates (GDA94 Zone55)	648330 m E, 7408136 m N	
ASC Name	Brown Dermosol	
Representative Site	CH49	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Open depression	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	1-3%	
Slope Type	Open depression	

Brown Vertosol

Table 23 Summary: Brown Vertosol (Check Site 50)

Overview		
Coordinates (GDA94 Zone55)	647837 m E, 7408435 m N	
ASC Name	Brown Vertosol	
Representative Site	CH50	
Soil Map Unit	1B	
Survey Type	Check site	
Dominant Topography	Closed depression	
Dominant Land Use	Grazing	
Vegetation	Eucalyptus	
Slope (%)	3-10%	
Slope Type	Lower slope	

Brown Dermosol

Table 24 Summary: Brown Dermosol (Check Site 51)

Overview		
Coordinates (GDA94 Zone55)	648107 m E, 7409726 m N	
ASC Name	Brown Dermosol	
Representative Site	CH51	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Lower slope	
Dominant Land Use	Pasture	
Vegetation	Other	
Slope (%)	1-3%	
Slope Type	Lower slope	

Brown Dermosol

Table 25 Summary: Brown Dermosol (Check Site 52)

Overview		
Coordinates (GDA94 Zone55)	648237 m E, 7409762 m N	
ASC Name	Brown Dermosol	
Representative Site	CH52	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Closed depression	
Dominant Land Use	Grazing	
Vegetation	Eucalyptus	
Slope (%)	3-10%	
Slope Type	Closed depression	

Brown Dermosol

Table 26 Summary: Brown Dermosol (Check Site 53)

Overview		
Coordinates (GDA94 Zone55)	648383 m E, 7409590 m N	
ASC Name	Brown Dermosol	
Representative Site	CH53	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Pasture	
Vegetation	Other	
Slope (%)	<1%	
Slope Type	Mid slope	

Brown Dermosol

Table 27 Summary: Brown Dermosol (Check Site 54)

Overview		
Coordinates (GDA94 Zone55)	648536 m E, 7409422 m N	
ASC Name	Brown Dermosol	
Representative Site	CH54	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Open depression	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	3-10%	
Slope Type	Open depression	

Brown Dermosol

Table 28 Summary: Brown Dermosol (Check Site 55)

Overview		
Coordinates (GDA94 Zone55)	648747 m E, 7409276 m N	
ASC Name	Brown Dermosol	
Representative Site	CH55	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	3-10%	
Slope Type	Mid slope	

Rudosol

Table 29 Summary: Rudosol (Check Site 56)

Overview		
Coordinates (GDA94 Zone55)	649824 m E, 7408247 m N	
ASC Name	Rudosol	
Representative Site	CH56	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Upper slope	
Dominant Land Use	Reserve	
Vegetation	Eucalyptus	
Slope (%)	3-10%	
Slope Type	Upper slope	

Brown Dermosol

Table 30 Summary: Brown Dermosol (Check Site 57)

Overview		
Coordinates (GDA94 Zone55)	649999 m E, 7408590 m N	
ASC Name	Brown Dermosol	
Representative Site	CH57	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Mid slope	

Brown Dermosol

Table 31 Summary: Brown Dermosol (Check Site 58)

Overview		
Coordinates (GDA94 Zone55)	649872 m E, 7409128 m N	
ASC Name	Brown Dermosol	
Representative Site	CH58	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Mid slope	

Brown Dermosol

Table 32 Summary: Brown Dermosol (Check Site 59)

Overview		
Coordinates (GDA94 Zone55)	649469 m E, 7409541 m N	
ASC Name	Brown Dermosol	
Representative Site	CH59	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Open depression	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Open depression	

Brown Dermosol

Table 33 Summary: Brown Dermosol (Check Site 60)

Overview		
Coordinates (GDA94 Zone55)	649195 m E, 7409843 m N	
ASC Name	Brown Dermosol	
Representative Site	CH60	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Level plain	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	<1%	
Slope Type	Flat	

Brown Dermosol

Table 34 Summary: Brown Dermosol (Check Site 61)

Overview		
Coordinates (GDA94 Zone55)	648669 m E, 7410056 m N	
ASC Name	Brown Dermosol	
Representative Site	CH61	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Lower slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Lower slope	

Brown Dermosol

Table 35 Summary: Brown Dermosol (Check Site 62)

Overview		
Coordinates (GDA94 Zone55)	648554 m E, 7409112 m N	
ASC Name	Brown Dermosol	
Representative Site	CH62	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	1-3%	
Slope Type	Mid slope	

Brown Dermosol

Table 36 Summary: Brown Dermosol (Check Site 63)

Overview		
Coordinates (GDA94 Zone55)	648538 m E, 7408873 m N	
ASC Name	Brown Dermosol	
Representative Site	CH63	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Lower slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	1-3%	
Slope Type	Lower slope	

Brown Dermosol

Table 37 Summary: Brown Dermosol (Check Site 64)

Overview		
Coordinates (GDA94 Zone55)	648458 m E, 7408534 m N	
ASC Name	Brown Dermosol	
Representative Site	CH64	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	1-3%	
Slope Type	Mid slope	

Brown Dermosol

Table 38 Summary: Brown Dermosol (Check Site 65)

Overview		
Coordinates (GDA94 Zone55)	648972 m E, 7409058 m N	
ASC Name	Brown Dermosol	
Representative Site	CH65	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	1-3%	
Slope Type	Mid slope	

Brown Dermosol

Table 39 Summary: Brown Dermosol (Check Site 66)

Overview		
Coordinates (GDA94 Zone55)	649024 m E, 7408842 m N	
ASC Name	Brown Dermosol	
Representative Site	CH66	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Open depression	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	3-10%	
Slope Type	Open depression	

Brown Dermosol

Table 40 Summary: Brown Dermosol (Check Site 67)

Overview		
Coordinates (GDA94 Zone55)	649088 m E, 7408698 m N	
ASC Name	Brown Dermosol	
Representative Site	CH67	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	3-10%	
Slope Type	Mid slope	

Brown Dermosol

Table 41 Summary: Brown Dermosol (Check Site 68)

Overview		
Coordinates (GDA94 Zone55)	649115 m E, 7407764 m N	
ASC Name	Brown Dermosol	
Representative Site	CH68	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Upper slope	
Dominant Land Use	Reserve	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Upper slope	

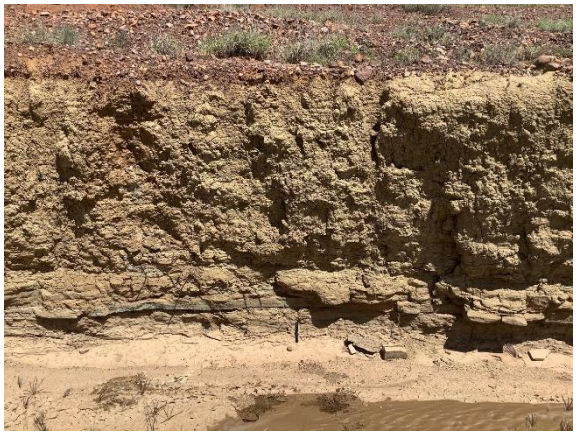
Red Dermosol

Table 42 Summary: Red Dermosol (Check Site 69)

Overview		
Coordinates (GDA94 Zone55)	649065 m E, 7407716 m N	
ASC Name	Red Dermosol	
Representative Site	CH69	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Upper slope	
Dominant Land Use	Reserve	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Upper slope	

Brown Dermosol

Table 43 Summary: Brown Dermosol (Check Site 70)

Overview		
Coordinates (GDA94 Zone55)	649017 m E, 7407842 m N	
ASC Name	Brown Dermosol	
Representative Site	CH70	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Depression	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Closed depression	

Brown Dermosol

Table 44 Summary: Brown Dermosol (Check Site 71)

Overview		
Coordinates (GDA94 Zone55)	648851 m E, 7407971 m N	
ASC Name	Brown Dermosol	
Representative Site	CH71	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Mid slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	3-10%	
Slope Type	Mid slope	

Red Dermosol

Table 45 Summary: Red Dermosol (Check Site 72)

Overview		
Coordinates (GDA94 Zone55)	648655 m E, 7408105 m N	
ASC Name	Red Dermosol	
Representative Site	CH72	
Soil Map Unit	2C	
Survey Type	Check site	
Dominant Topography	Upper slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	3-10%	
Slope Type	Upper slope	

Brown Vertosol

Table 46 Summary: Brown Vertosol (Check Site 73)

Overview		
Coordinates (GDA94 Zone55)	647125 m E, 7408856 m N	
ASC Name	Brown Vertosol	
Representative Site	CH73	
Soil Map Unit	1B	
Survey Type	Check site	
Dominant Topography	Lower slope	
Dominant Land Use	Grazing	
Vegetation	Other	
Slope (%)	1-3%	
Slope Type	Lower slope	

Brown Vertosol

Table 47 Summary: Brown Vertosol (Check Site 74)

Overview		
Coordinates (GDA94 Zone55)	646375 m E, 7407893 m N	
ASC Name	Brown Vertosol	
Representative Site	CH74	
Soil Map Unit	1B	
Survey Type	Check site	
Dominant Topography	Lower slope	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Slope (%)	1-3%	
Slope Type	Lower slope	

Appendix C Soil Laboratory Certificates of Analysis

Ensham Life of Mine Extension Project – Zone 1

Land Resource Assessment

Ensham Resources Pty Ltd

SLR Project No.: 620.041251.00001

31 January 2025

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AGRICULTURAL SOIL ANALYSIS REPORT

81 samples supplied by SLR Consulting Australia Pty Ltd on 6/12/2021 . Lab Job No.M4178
Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
		Sample ID:	BH02_0-10	BH02_20-30	BH02_50-60	BH02_90-100	BH03_0-10	BH03_20-30
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/1	M4178/2	M4178/3	M4178/4	M4178/5	M4178/6
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	8.3	7.2	5.8	1.9	8.4	7.0
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	5.28	5.02	5.06	4.90	4.68	4.88
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.058	0.031	0.054	0.118	0.030	0.031
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	2.21	1.43	1.02	1.17	2.40	2.63
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	1.0	0.33	0.37	0.76	0.14	0.18
		(kg/ha)		459	147	166	343	63	82
		(mg/kg)		205	66	74	153	28	37
	Exchangeable Magnesium	(cmol$_+$/kg)		0.36	0.15	0.89	2.3	0.08	0.07
		(kg/ha)		97	42	243	632	23	19
		(mg/kg)		43	19	108	282	10	8.7
	Exchangeable Potassium	(cmol$_+$/kg)		0.41	0.28	0.30	0.40	0.19	0.23
		(kg/ha)		358	247	260	352	166	199
		(mg/kg)		160	110	116	157	74	89
	Exchangeable Sodium	(cmol$_+$/kg)		<0.065	<0.065	0.14	0.40	<0.065	<0.065
		(kg/ha)		<33	<33	70	205	<33	<33
		(mg/kg)		<15	<15	31	92	<15	<15
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	0.15	0.41	0.47	0.34	1.6	1.7
		(kg/ha)		30	83	95	68	313	341
		(mg/kg)		13	37	42	30	140	152
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	0.14	0.59	0.36	0.30	0.83	0.70
		(kg/ha)		3.2	13	8.1	6.8	19	16
		(mg/kg)		1.4	5.9	3.6	3.0	8.3	7.0
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	2.1	1.8	2.5	4.5	2.8	2.9
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	48	18	15	17	4.9	6.3
	Magnesium (%)			17	8.5	35	51	3.0	2.5
	Potassium (%)			19	16	12	8.9	6.7	7.9
	Sodium - ESP (%)			2.5	2.4	5.4	8.8	0.90	0.74
	Aluminium (%)			6.9	23	19	7.5	55	58
	Hydrogen (%)			6.7	33	14	6.7	29	24
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	2.9	2.1	0.41	0.33	1.7	2.6
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	1.26	0.82	0.58	0.67	1.37	1.50
	Total Nitrogen (%)			0.08	0.03	0.06	0.06	0.09	0.10
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	16.8	30.2	9.4	10.5	15.1	15.5
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	37	20	35	76	19	20

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Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
	Sample ID:	BH02_0-10	BH02_20-30	BH02_50-60	BH02_90-100	BH03_0-10	BH03_20-30
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter / Method reference	M4178/1	M4178/2	M4178/3	M4178/4	M4178/5	M4178/6

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil results'.
10. Conversions for 1 $cmol_+/kg$ = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimate
13. ** NATA accreditation does not cover the performance of this service.
14. Analysis conducted between sample arrival date and reporting date.
15. This report is not to be reproduced except in full. Results only relate to the item tested.
16. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer SCU.edu.au/eal/t&cs).
17. This report was issued on 14/12/2021.

NATA WORLD RECOGNISED ACCREDITATION
Accreditation No. 14960
Accredited for compliance with ISO/IEC 17025 - Testing

Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

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			Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
		Sample ID:	BH03_30-40	BH04_0-10	BH04_15-25	BH05_0-10	BH05_20-30	BH05_50-60
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/7	M4178/8	M4178/9	M4178/10	M4178/11	M4178/12
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	4.9	14	11	5.3	7.8	3.5
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	4.58	5.26	5.03	5.31	4.93	4.81
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.028	0.031	0.030	1.618	0.497	0.577
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	2.28	3.54	4.31	2.17	2.12	0.90
	Exchangeable Calcium	(cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	0.19	0.71	0.67	1.5	0.59	0.17
		(kg/ha)		87	320	302	662	267	78
		(mg/kg)		39	143	135	295	119	35
	Exchangeable Magnesium	(cmol+/kg)		0.09	0.18	0.17	12	7.7	8.3
		(kg/ha)		24	49	47	3,261	2,095	2,264
		(mg/kg)		11	22	21	1,456	935	1,011
	Exchangeable Potassium	(cmol+/kg)		0.19	0.22	0.22	0.25	0.24	0.33
		(kg/ha)		169	191	190	222	209	286
		(mg/kg)		75	85	85	99	93	127
	Exchangeable Sodium	(cmol+/kg)		<0.065	<0.065	<0.065	5.2	3.3	3.9
		(kg/ha)		<33	<33	<33	2,700	1,676	2,032
		(mg/kg)		<15	<15	<15	1,205	748	907
	Exchangeable Aluminium	(cmol+/kg)	**Inhouse S37 (KCl)	1.9	0.87	1.4	0.08	0.67	0.74
		(kg/ha)		386	176	280	17	135	149
		(mg/kg)		172	79	125	7.5	60	67
	Exchangeable Hydrogen	(cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	0.91	0.52	0.73	0.08	0.56	0.66
		(kg/ha)		20	12	16	1.8	13	15
		(mg/kg)		9.1	5.2	7.3	<1	5.6	6.6
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	3.3	2.5	3.2	19	13	14
	Calcium (%)		**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	5.8	28	21	7.7	4.6	1.2
	Magnesium (%)			2.6	7.2	5.4	63	59	59
	Potassium (%)			5.8	8.6	6.8	1.3	1.8	2.3
	Sodium - ESP (%)			1.1	0.82	0.70	27	25	28
	Aluminium (%)			57	35	43	0.44	5.1	5.2
	Hydrogen (%)			27	21	23	0.42	4.3	4.7
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol+/kg)	2.2	3.9	3.9	0.12	0.08	0.02
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	1.30	2.02	2.46	1.24	1.21	0.52
	Total Nitrogen (%)			0.12	0.10	0.12	0.12	0.09	0.06
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	11.1	19.4	21.2	10.0	13.0	9.4
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	18	20	19	1,036	318	369

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Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
	Sample ID:	BH03_30-40	BH04_0-10	BH04_15-25	BH05_0-10	BH05_20-30	BH05_50-60
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/7	M4178/8	M4178/9	M4178/10	M4178/11	M4178/12

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwo
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil res
10. Conversions for 1 $cmol_+/kg$ = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
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Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

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			Sample 13	Sample 14	Sample 15	Sample 16	Sample 17	Sample 18
		Sample ID:	BH05_90-100	BH08_0-10	BH08_20-30	BH08_50-60	BH08_90-100	BH09_0-10
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/13	M4178/14	M4178/15	M4178/16	M4178/17	M4178/18
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	2.9	5.4	2.9	2.4	2.5	1.5
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	4.95	8.95	8.94	8.82	9.01	9.45
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.679	0.470	0.997	1.246	0.726	0.218
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	0.56	2.22	1.73	0.87	1.04	1.50
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	0.05	22	22	12	15	23
		(kg/ha)		23	9,867	9,862	5,506	6,597	10,150
		(mg/kg)		10	4,405	4,403	2,458	2,945	4,531
	Exchangeable Magnesium	(cmol$_+$/kg)		8.7	11	12	14	13	12
		(kg/ha)		2,364	2,868	3,228	3,811	3,470	3,204
		(mg/kg)		1,056	1,280	1,441	1,701	1,549	1,430
	Exchangeable Potassium	(cmol$_+$/kg)		0.39	0.53	0.43	0.39	0.41	0.44
		(kg/ha)		341	467	373	343	355	384
		(mg/kg)		152	209	167	153	158	171
	Exchangeable Sodium	(cmol$_+$/kg)		5.0	3.4	5.8	8.5	5.6	2.4
		(kg/ha)		2,599	1,745	2,968	4,393	2,865	1,244
		(mg/kg)		1,160	779	1,325	1,961	1,279	555
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	0.49	0.02	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		99	3.9	1.1	<1	<1	<1
		(mg/kg)		44	1.7	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	0.74	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		17	<1	<1	<1	<1	<1
		(mg/kg)		7.4	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	15	36	40	35	33	37
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	0.33	60	55	35	44	61
	Magnesium (%)			56	29	30	40	38	32
	Potassium (%)			2.5	1.5	1.1	1.1	1.2	1.2
	Sodium - ESP (%)			33	9.3	14	24	17	6.5
	Aluminium (%)			3.2	0.05	0.01	0.01	0.01	0.00
	Hydrogen (%)			4.8	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	0.01	2.1	1.9	0.88	1.2	1.9
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.32	1.27	0.99	0.50	0.59	0.86
	Total Nitrogen (%)			0.06	0.10	0.07	0.08	0.08	0.06
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	5.6	12.2	13.7	6.7	7.3	15.5
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	435	301	638	797	465	140

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Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 13	Sample 14	Sample 15	Sample 16	Sample 17	Sample 18
	Sample ID:	BH05_90-100	BH08_0-10	BH08_20-30	BH08_50-60	BH08_90-100	BH09_0-10
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/13	M4178/14	M4178/15	M4178/16	M4178/17	M4178/18

Notes:

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ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

81 samples supplied by SLR Consulting Australia Pty Ltd on 6/12/2021 . Lab Job No.M4178
Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Sample 19	Sample 20	Sample 21	Sample 22	Sample 23	Sample 24
		Sample ID:	BH09_20-30	BH09_50-60	BH09_90-100	BH11_0-10	BH11_20-30	BH11_50-60
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/19	M4178/20	M4178/21	M4178/22	M4178/23	M4178/24
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	1.6	1.3	1.5	22	1.5	<1
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	9.45	9.80	9.83	8.62	9.17	9.06
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.213	0.184	0.569	0.131	0.190	0.354
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	1.28	0.55	0.36	2.22	1.15	2.42
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	22	7.8	4.9	20	14	24
		(kg/ha)		9,776	3,512	2,183	8,812	6,188	10,887
		(mg/kg)		4,364	1,568	974	3,934	2,763	4,860
	Exchangeable Magnesium	(cmol$_+$/kg)		12	9.0	6.9	5.4	3.9	6.8
		(kg/ha)		3,310	2,437	1,866	1,461	1,073	1,859
		(mg/kg)		1,478	1,088	833	652	479	830
	Exchangeable Potassium	(cmol$_+$/kg)		0.42	0.23	0.22	1.3	0.35	0.29
		(kg/ha)		372	198	194	1,142	309	252
		(mg/kg)		166	88	87	510	138	112
	Exchangeable Sodium	(cmol$_+$/kg)		2.4	2.4	7.5	0.27	2.3	2.1
		(kg/ha)		1,244	1,217	3,873	137	1,164	1,090
		(mg/kg)		555	543	1,729	61	520	487
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	37	19	19	27	20	33
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	59	40	25	74	68	72
	Magnesium (%)			33	46	35	20	19	20
	Potassium (%)			1.2	1.2	1.1	4.9	1.7	0.86
	Sodium - ESP (%)			6.6	12	39	1.0	11	6.3
	Aluminium (%)			0.00	0.01	0.02	0.00	0.01	0.00
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	1.8	0.87	0.71	3.7	3.5	3.6
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.73	0.31	0.20	1.27	0.66	1.38
	Total Nitrogen (%)			0.05	0.03	0.03	0.11	0.05	0.09
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	15.6	9.5	6.0	12.1	12.6	15.2
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	136	118	364	84	122	227

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		Sample 19	Sample 20	Sample 21	Sample 22	Sample 23	Sample 24
	Sample ID:	BH09_20-30	BH09_50-60	BH09_90-100	BH11_0-10	BH11_20-30	BH11_50-60
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/19	M4178/20	M4178/21	M4178/22	M4178/23	M4178/24

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwo
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil res
10. Conversions for 1 $cmol_+/kg$ = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimat
13. ** NATA accreditation does not cover the performance of this service.
14. Analysis conducted between sample arrival date and reporting date.
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16. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditio
17. This report was issued on 14/12/2021.

Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

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			Sample 25	Sample 26	Sample 27	Sample 28	Sample 29	Sample 30
		Sample ID:	BH11_90-100	BH12_0-10	BH12_20-30	BH12_50-60	BH12_90-100	BH13_0-10
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/25	M4178/26	M4178/27	M4178/28	M4178/29	M4178/30
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	1.4	4.7	1.4	1.2	1.2	3.0
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	9.04	7.66	7.41	7.45	7.89	7.58
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.796	0.060	0.019	0.028	0.030	0.020
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	2.21	1.32	0.76	0.43	0.41	0.74
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	21	3.7	2.6	3.3	4.5	2.8
		(kg/ha)		9,293	1,657	1,158	1,490	1,998	1,242
		(mg/kg)		4,149	740	517	665	892	554
	Exchangeable Magnesium	(cmol$_+$/kg)		10	0.88	0.46	0.46	0.93	0.21
		(kg/ha)		2,816	239	126	126	254	56
		(mg/kg)		1,257	107	56	56	113	25
	Exchangeable Potassium	(cmol$_+$/kg)		0.25	0.51	0.23	0.32	0.16	0.19
		(kg/ha)		221	445	203	276	138	165
		(mg/kg)		98	199	91	123	61	74
	Exchangeable Sodium	(cmol$_+$/kg)		4.4	<0.065	<0.065	<0.065	0.07	<0.065
		(kg/ha)		2,263	<33	<33	<33	<33	<33
		(mg/kg)		1,010	<15	<15	<15	<15	<15
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	36	5.1	3.3	4.1	5.6	3.2
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	58	72	78	80	79	87
	Magnesium (%)			29	17	14	11	17	6.4
	Potassium (%)			0.71	9.9	7.0	7.6	2.8	5.9
	Sodium - ESP (%)			12	1.0	0.77	0.85	1.2	0.65
	Aluminium (%)			0.00	0.05	0.08	0.08	0.07	0.13
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	2.0	4.2	5.6	7.2	4.8	13
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	1.26	0.76	0.43	0.25	0.24	0.43
	Total Nitrogen (%)			0.04	0.08	0.04	0.04	0.03	0.03
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	30.0	10.0	11.7	6.9	9.0	12.9
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	509	38	12	18	19	13

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		Sample 25	Sample 26	Sample 27	Sample 28	Sample 29	Sample 30
	Sample ID:	BH11_90-100	BH12_0-10	BH12_20-30	BH12_50-60	BH12_90-100	BH13_0-10
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/25	M4178/26	M4178/27	M4178/28	M4178/29	M4178/30

Notes:

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			Sample 31	Sample 32	Sample 33	Sample 34	Sample 35	Sample 36
		Sample ID:	BH13_20-30	BH13_50-60	BH13_90-100	BH14_0-10	BH14_20-30	BH14_50-60
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/31	M4178/32	M4178/33	M4178/34	M4178/35	M4178/36
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	2.0	1.8	2.5	5.5	2.9	1.0
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.85	8.35	8.69	6.61	6.47	8.18
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.023	0.040	0.058	0.038	0.022	0.093
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	0.46	0.55	0.38	1.69	1.27	0.62
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	2.5	2.9	4.0	3.1	3.0	11
		(kg/ha)		1,141	1,322	1,802	1,385	1,338	5,149
		(mg/kg)		509	590	804	618	597	2,298
	Exchangeable Magnesium	(cmol$_+$/kg)		0.26	0.42	0.71	0.96	0.68	3.3
		(kg/ha)		70	115	193	261	184	887
		(mg/kg)		31	51	86	116	82	396
	Exchangeable Potassium	(cmol$_+$/kg)		0.23	0.41	0.74	0.49	0.33	0.26
		(kg/ha)		204	358	648	426	288	226
		(mg/kg)		91	160	289	190	129	101
	Exchangeable Sodium	(cmol$_+$/kg)		<0.065	0.07	<0.065	<0.065	<0.065	0.25
		(kg/ha)		<33	36	<33	<33	<33	129
		(mg/kg)		<15	16	<15	<15	<15	58
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	1.3	1.0	<1	<1	1.3
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	3.1	3.9	5.5	4.6	4.0	15
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	83	76	73	68	74	75
	Magnesium (%)			8.4	11	13	21	17	21
	Potassium (%)			7.6	11	13	11	8.2	1.7
	Sodium - ESP (%)			1.1	1.8	0.80	0.56	0.51	1.6
	Aluminium (%)			0.14	0.16	0.09	0.08	0.08	0.04
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.50	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	9.9	7.0	5.7	3.2	4.4	3.5
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.26	0.32	0.22	0.97	0.72	0.35
	Total Nitrogen (%)			0.04	0.04	0.04	0.11	0.06	0.04
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	6.5	8.6	6.0	9.0	11.9	8.4
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	15	26	37	24	14	60

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		Sample 31	Sample 32	Sample 33	Sample 34	Sample 35	Sample 36
Sample ID:		BH13_20-30	BH13_50-60	BH13_90-100	BH14_0-10	BH14_20-30	BH14_50-60
Crop:		Soil	Soil	Soil	Soil	Soil	Soil
Client:		SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/31	M4178/32	M4178/33	M4178/34	M4178/35	M4178/36

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
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5. Guidelines for phosphorus have been reduced for Australian soils.
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			Sample 37	Sample 38	Sample 39	Sample 40	Sample 41	Sample 42
		Sample ID:	BH14_90-100	BH16_0-10	BH16_20-30	BH16_50-60	BH16_90-100	BH18_0-10
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/37	M4178/38	M4178/39	M4178/40	M4178/41	M4178/42
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	<1	9.5	4.2	7.6	17	21
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.89	8.90	9.01	8.71	8.58	8.81
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.094	0.152	0.272	0.904	0.914	0.216
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	0.35	2.54	2.24	1.47	0.65	1.50
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	7.3	31	28	20	13	30
		(kg/ha)		3,286	14,026	12,602	9,000	5,713	13,674
		(mg/kg)		1,467	6,262	5,626	4,018	2,550	6,104
	Exchangeable Magnesium	(cmol$_+$/kg)		4.6	9.8	12	13	10	8.7
		(kg/ha)		1,249	2,680	3,249	3,498	2,748	2,379
		(mg/kg)		557	1,196	1,450	1,562	1,227	1,062
	Exchangeable Potassium	(cmol$_+$/kg)		0.38	1.1	0.90	0.77	0.58	1.2
		(kg/ha)		332	973	789	673	510	1,051
		(mg/kg)		148	435	352	300	228	469
	Exchangeable Sodium	(cmol$_+$/kg)		0.62	1.4	3.0	5.5	5.0	1.3
		(kg/ha)		318	696	1,536	2,827	2,590	665
		(mg/kg)		142	311	686	1,262	1,156	297
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	13	44	44	39	28	42
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	57	72	64	51	45	73
	Magnesium (%)			36	23	27	33	35	21
	Potassium (%)			2.9	2.6	2.1	2.0	2.0	2.9
	Sodium - ESP (%)			4.8	3.1	6.8	14	18	3.1
	Aluminium (%)			0.03	0.00	0.00	0.00	0.01	0.00
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	1.6	3.2	2.4	1.6	1.3	3.5
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.20	1.45	1.28	0.84	0.37	0.86
	Total Nitrogen (%)			0.08	0.09	0.08	0.03	0.02	0.06
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	2.6	16.3	15.6	27.9	17.7	14.5
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	60	97	174	579	585	138

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AGRICULTURAL SOIL ANALYSIS REPORT

81 samples supplied by SLR Consulting Australia Pty Ltd on 6/12/2021 . Lab Job No.M4178
Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 37	Sample 38	Sample 39	Sample 40	Sample 41	Sample 42
	Sample ID:	BH14_90-100	BH16_0-10	BH16_20-30	BH16_50-60	BH16_90-100	BH18_0-10
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/37	M4178/38	M4178/39	M4178/40	M4178/41	M4178/42

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwo
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil res
10. Conversions for 1 $cmol_+/kg$ = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimat
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Quality Checked: Kris Saville
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			Sample 43	Sample 44	Sample 45	Sample 46	Sample 47	Sample 48
		Sample ID:	BH18_20-30	BH18_50-60	BH18_90-100	BH22_0-10	BH22_20-30	BH22_50-60
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/43	M4178/44	M4178/45	M4178/46	M4178/47	M4178/48
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	20	21	24	15	7.6	4.3
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.78	8.71	8.44	8.65	8.64	8.68
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.366	0.533	0.993	0.521	0.527	0.476
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	1.59	1.54	1.12	2.03	1.56	1.82
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	31	31	22	32	31	30
		(kg/ha)		14,004	13,898	9,778	14,344	13,706	13,386
		(mg/kg)		6,252	6,205	4,365	6,404	6,119	5,976
	Exchangeable Magnesium	(cmol$_+$/kg)		11	14	13	10	11	12
		(kg/ha)		3,065	3,823	3,637	2,797	2,880	3,138
		(mg/kg)		1,368	1,707	1,624	1,249	1,285	1,401
	Exchangeable Potassium	(cmol$_+$/kg)		1.3	1.1	0.88	1.2	1.0	0.89
		(kg/ha)		1,097	935	771	1,033	910	780
		(mg/kg)		490	417	344	461	406	348
	Exchangeable Sodium	(cmol$_+$/kg)		2.8	3.7	4.8	3.2	3.3	3.6
		(kg/ha)		1,465	1,912	2,460	1,625	1,715	1,855
		(mg/kg)		654	854	1,098	725	765	828
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	47	50	41	47	45	46
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	67	62	53	69	67	65
	Magnesium (%)			24	28	33	22	23	25
	Potassium (%)			2.7	2.1	2.2	2.5	2.3	1.9
	Sodium - ESP (%)			6.1	7.5	12	6.8	7.3	7.9
	Aluminium (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	2.8	2.2	1.6	3.1	2.9	2.6
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.91	0.88	0.64	1.16	0.89	1.04
	Total Nitrogen (%)			0.06	0.07	0.74	0.12	0.11	0.10
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	15.4	12.2	0.9	9.7	8.4	10.1
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	234	341	636	333	337	305

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Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 43	Sample 44	Sample 45	Sample 46	Sample 47	Sample 48
	Sample ID:	BH18_20-30	BH18_50-60	BH18_90-100	BH22_0-10	BH22_20-30	BH22_50-60
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/43	M4178/44	M4178/45	M4178/46	M4178/47	M4178/48

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwo
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil res
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			Sample 49	Sample 50	Sample 51	Sample 52	Sample 53	Sample 54
		Sample ID:	BH22_90-100	BH26_0-10	BH26_20-30	BH26_50-60	BH26_90-100	BH29_0-10
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/49	M4178/50	M4178/51	M4178/52	M4178/53	M4178/54
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	2.9	27	18	5.8	16	11
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.74	8.49	8.14	8.90	9.17	7.76
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.350	0.082	0.330	0.302	0.232	0.084
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	1.28	1.40	1.72	1.54	0.95	3.94
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	23	23	22	26	18	29
		(kg/ha)		10,490	10,407	10,091	11,543	7,938	13,043
		(mg/kg)		4,683	4,646	4,505	5,153	3,544	5,823
	Exchangeable Magnesium	(cmol$_+$/kg)		13	6.8	8.2	11	7.7	11
		(kg/ha)		3,602	1,853	2,232	3,094	2,106	2,969
		(mg/kg)		1,608	827	996	1,381	940	1,325
	Exchangeable Potassium	(cmol$_+$/kg)		0.76	1.1	0.81	0.49	0.42	1.6
		(kg/ha)		666	980	706	427	366	1,406
		(mg/kg)		297	437	315	190	163	628
	Exchangeable Sodium	(cmol$_+$/kg)		5.0	0.38	2.2	2.9	2.2	0.27
		(kg/ha)		2,570	198	1,142	1,481	1,130	138
		(mg/kg)		1,147	89	510	661	504	62
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	42	31	34	40	28	42
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	55	74	67	64	63	69
	Magnesium (%)			31	22	24	28	28	26
	Potassium (%)			1.8	3.6	2.4	1.2	1.5	3.8
	Sodium - ESP (%)			12	1.2	6.6	7.1	7.8	0.64
	Aluminium (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	1.8	3.4	2.7	2.3	2.3	2.7
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.73	0.80	0.98	0.88	0.54	2.25
	Total Nitrogen (%)			0.08	0.08	0.10	0.09	0.05	0.18
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	9.8	10.7	9.5	10.4	10.6	12.6
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	224	52	211	193	148	54

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Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 49	Sample 50	Sample 51	Sample 52	Sample 53	Sample 54
	Sample ID:	BH22_90-100	BH26_0-10	BH26_20-30	BH26_50-60	BH26_90-100	BH29_0-10
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/49	M4178/50	M4178/51	M4178/52	M4178/53	M4178/54

Notes:

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3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
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5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
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			Sample 55	Sample 56	Sample 57	Sample 58	Sample 59	Sample 60
		Sample ID:	BH29_20-30	BH29_50-60	BH29_90-100	BH30_0-10	BH30_20-30	BH30_50-60
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/55	M4178/56	M4178/57	M4178/58	M4178/59	M4178/60
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	15	31	35	2.1	1.5	1.1
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.19	8.28	8.34	7.31	7.97	8.11
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.099	0.084	0.069	0.026	0.022	0.022
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	3.66	2.57	2.29	0.89	0.46	0.30
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	24	21	20	20	13	12
		(kg/ha)		10,821	9,298	8,761	9,167	5,994	5,198
		(mg/kg)		4,831	4,151	3,911	4,093	2,676	2,320
	Exchangeable Magnesium	(cmol$_+$/kg)		8.3	7.6	7.2	8.8	7.5	8.1
		(kg/ha)		2,257	2,073	1,947	2,407	2,048	2,199
		(mg/kg)		1,008	925	869	1,074	914	982
	Exchangeable Potassium	(cmol$_+$/kg)		0.86	0.91	1.0	0.28	0.23	0.23
		(kg/ha)		755	797	881	248	203	198
		(mg/kg)		337	356	393	111	91	88
	Exchangeable Sodium	(cmol$_+$/kg)		0.32	0.32	0.30	0.20	0.25	0.22
		(kg/ha)		164	165	154	103	130	114
		(mg/kg)		73	74	69	46	58	51
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	34	30	28	30	21	20
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	72	70	70	69	63	58
	Magnesium (%)			25	26	26	30	35	40
	Potassium (%)			2.6	3.1	3.6	0.95	1.1	1.1
	Sodium - ESP (%)			0.95	1.1	1.1	0.67	1.2	1.1
	Aluminium (%)			0.00	0.00	0.00	0.01	0.01	0.01
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	2.9	2.7	2.7	2.3	1.8	1.4
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	2.09	1.47	1.31	0.51	0.27	0.17
	Total Nitrogen (%)			0.15	0.12	0.13	0.11	0.09	0.07
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	14.4	12.5	10.2	4.5	3.1	2.4
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	63	54	44	17	14	14

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Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 55	Sample 56	Sample 57	Sample 58	Sample 59	Sample 60
	Sample ID:	BH29_20-30	BH29_50-60	BH29_90-100	BH30_0-10	BH30_20-30	BH30_50-60
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/55	M4178/56	M4178/57	M4178/58	M4178/59	M4178/60

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwo
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil res
10. Conversions for 1 $cmol_+/kg$ = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimat
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AGRICULTURAL SOIL ANALYSIS REPORT

81 samples supplied by SLR Consulting Australia Pty Ltd on 6/12/2021 . Lab Job No.M4178
Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Sample 61	Sample 62	Sample 63	Sample 64	Sample 65	Sample 66
		Sample ID:	BH30_70-80	BH32_0-10	BH32_20-30	BH32_50-60	BH32_90-100	BH34_0-10
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/61	M4178/62	M4178/63	M4178/64	M4178/65	M4178/66
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	1.3	11	5.3	1.7	2.6	9.3
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.86	7.02	7.39	8.44	8.81	5.97
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.125	0.025	0.026	0.070	0.159	0.910
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	0.55	1.23	1.30	0.89	0.87	1.75
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	17	3.8	4.6	8.9	13	5.6
		(kg/ha)		7,842	1,685	2,044	4,003	6,043	2,497
		(mg/kg)		3,501	752	913	1,787	2,698	1,115
	Exchangeable Magnesium	(cmol$_+$/kg)		11	0.80	0.80	2.4	3.2	3.9
		(kg/ha)		2,990	218	218	667	865	1,074
		(mg/kg)		1,335	98	97	298	386	480
	Exchangeable Potassium	(cmol$_+$/kg)		0.33	0.70	0.46	0.49	0.45	0.53
		(kg/ha)		288	610	407	428	396	463
		(mg/kg)		129	272	182	191	177	207
	Exchangeable Sodium	(cmol$_+$/kg)		0.35	<0.065	0.07	0.30	0.36	1.8
		(kg/ha)		180	<33	34	156	186	921
		(mg/kg)		81	<15	15	69	83	411
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	29	5.3	5.9	12	17	12
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	60	71	77	73	77	47
	Magnesium (%)			38	15	14	20	18	33
	Potassium (%)			1.1	13	7.9	4.0	2.6	4.5
	Sodium - ESP (%)			1.2	1.1	1.1	2.5	2.1	15
	Aluminium (%)			0.01	0.06	0.06	0.02	0.02	0.03
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.10
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	1.6	4.7	5.7	3.6	4.2	1.4
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.32	0.71	0.74	0.51	0.50	1.00
	Total Nitrogen (%)			0.08	0.10	0.09	0.10	0.07	0.14
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	3.8	7.3	8.0	5.1	7.0	7.4
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	80	16	17	45	102	582

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Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 61	Sample 62	Sample 63	Sample 64	Sample 65	Sample 66
	Sample ID:	BH30_70-80	BH32_0-10	BH32_20-30	BH32_50-60	BH32_90-100	BH34_0-10
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/61	M4178/62	M4178/63	M4178/64	M4178/65	M4178/66

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwo
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil res
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			Sample 67	Sample 68	Sample 69	Sample 70	Sample 71	Sample 72
		Sample ID:	BH34_20-30	BH34_50-60	BH34_90-100	BH36_0-10	BH36_20-30	BH36_50-60
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/67	M4178/68	M4178/69	M4178/70	M4178/71	M4178/72
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	3.9	2.4	4.6	2.9	2.0	1.1
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.05	8.17	8.60	7.14	7.17	5.88
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	1.132	0.335	0.226	0.041	0.025	0.046
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	1.39	0.78	0.50	1.98	0.79	0.59
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	6.1	3.6	1.8	4.7	4.2	4.0
		(kg/ha)		2,741	1,634	790	2,119	1,887	1,798
		(mg/kg)		1,224	730	353	946	842	803
	Exchangeable Magnesium	(cmol$_+$/kg)		6.5	5.8	3.3	0.47	0.71	2.1
		(kg/ha)		1,773	1,589	903	128	193	581
		(mg/kg)		792	709	403	57	86	259
	Exchangeable Potassium	(cmol$_+$/kg)		<0.12	<0.12	<0.12	0.46	0.13	0.17
		(kg/ha)		<112	<112	<112	406	<112	152
		(mg/kg)		<50	<50	<50	181	<50	68
	Exchangeable Sodium	(cmol$_+$/kg)		3.6	3.1	1.9	<0.065	<0.065	0.20
		(kg/ha)		1,879	1,615	996	<33	<33	103
		(mg/kg)		839	721	445	<15	<15	46
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	<1	<1	<1	<1	1.7
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	0.01	<0.01	<0.01	<0.01	<0.01	0.03
		(kg/ha)		<1	<1	<1	<1	<1	<1
		(mg/kg)		<1	<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	16	13	7.1	5.7	5.1	6.6
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	37	29	25	83	83	61
	Magnesium (%)			40	46	47	8.3	14	33
	Potassium (%)			0.67	0.88	0.99	8.1	2.5	2.6
	Sodium - ESP (%)			22	25	27	0.67	0.94	3.0
	Aluminium (%)			0.02	0.03	0.04	0.06	0.07	0.13
	Hydrogen (%)			0.07	0.00	0.00	0.00	0.00	0.47
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	0.94	0.62	0.53	10	5.9	1.9
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.80	0.45	0.29	1.13	0.45	0.34
	Total Nitrogen (%)			0.13	0.09	0.09	0.14	0.10	0.10
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	6.3	4.8	3.1	7.9	4.8	3.3
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	724	214	145	26	16	29

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Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 67	Sample 68	Sample 69	Sample 70	Sample 71	Sample 72
	Sample ID:	BH34_20-30	BH34_50-60	BH34_90-100	BH36_0-10	BH36_20-30	BH36_50-60
	Crop:	Soil	Soil	Soil	Soil	Soil	Soil
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter	Method reference	M4178/67	M4178/68	M4178/69	M4178/70	M4178/71	M4178/72
Notes:								

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			Sample 73	Sample 74	Sample 75	Sample 76	Sample 77	Sample 78
		Sample ID:	BH36_90-100	BH38_0-10	BH38_20-30	BH38_50-60	BH38_90-100	BH39_0-10
		Crop:	Soil	Soil	Soil	Soil	Soil	Soil
		Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
	Parameter		Method reference	M4178/73	M4178/74	M4178/75	M4178/76	M4178/77	M4178/78
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	1.1	14	9.4	2.0	1.7	4.6
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.66	5.63	4.96	4.58	4.63	8.74
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.091	0.324	0.635	0.849	0.944	0.126
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	0.41	5.43	3.41	1.13	0.60	2.14
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	4.8	2.7	0.89	0.18	0.13	31
		(kg/ha)		2,160	1,225	399	81	57	13,883
		(mg/kg)		964	547	178	36	25	6,198
	Exchangeable Magnesium	(cmol$_+$/kg)		3.6	6.4	7.1	8.7	9.3	9.2
		(kg/ha)		969	1,738	1,926	2,356	2,536	2,496
		(mg/kg)		433	776	860	1,052	1,132	1,114
	Exchangeable Potassium	(cmol$_+$/kg)		0.16	0.62	0.37	0.30	0.31	1.0
		(kg/ha)		138	539	328	261	272	883
		(mg/kg)		61	241	147	117	121	394
	Exchangeable Sodium	(cmol$_+$/kg)		0.78	0.78	1.9	3.9	5.6	1.2
		(kg/ha)		402	402	987	2,009	2,872	618
		(mg/kg)		179	180	441	897	1,282	276
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	0.02	0.29	0.48	0.48	<0.01
		(kg/ha)		1.1	4.9	59	98	98	<1
		(mg/kg)		<1	2.2	26	44	44	<1
	Exchangeable Hydrogen	(cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	0.04	0.28	0.46	0.60	<0.01
		(kg/ha)		<1	<1	6.2	10	14	<1
		(mg/kg)		<1	<1	2.8	4.6	6.0	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	9.3	11	11	14	16	42
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	52	26	8.2	1.3	0.77	73
	Magnesium (%)			38	60	65	62	57	22
	Potassium (%)			1.7	5.8	3.5	2.1	1.9	2.4
	Sodium - ESP (%)			8.4	7.4	18	28	34	2.8
	Aluminium (%)			0.06	0.23	2.7	3.5	3.0	0.00
	Hydrogen (%)			0.00	0.36	2.6	3.3	3.7	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	1.4	0.43	0.13	0.02	0.01	3.4
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	0.24	3.10	1.95	0.65	0.34	1.22
	Total Nitrogen (%)			0.08	0.22	0.17	0.11	0.03	0.06
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	2.8	14.4	11.8	5.8	13.8	20.3
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	58	207	406	543	604	81

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	Parameter	Method reference	Sample 73	Sample 74	Sample 75	Sample 76	Sample 77	Sample 78
	Sample ID:		BH36_90-100	BH38_0-10	BH38_20-30	BH38_50-60	BH38_90-100	BH39_0-10
	Crop:		Soil	Soil	Soil	Soil	Soil	Soil
	Client:		SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd
			M4178/73	M4178/74	M4178/75	M4178/76	M4178/77	M4178/78

Notes:

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	Parameter	Method reference	Sample 79	Sample 80	Sample 81	*Heavy Soil*	*Medium Soil*	*Light Soil*	*Sandy Soil*
	Sample ID:		**BH39_20-30**	**BH39_50-60**	**BH39_90-100**				
	Crop:		**Soil**	**Soil**	**Soil**				
	Client:		**SLR Consulting Australia Pty Ltd**	**SLR Consulting Australia Pty Ltd**	**SLR Consulting Australia Pty Ltd**	*Clay*	*Clay Loam*	*Loam*	*Loamy Sand*
			M4178/79	**M4178/80**	**M4178/81**	**Indicative guidelines - refer to Notes 6 and 8**			
	Phosphorus (mg/kg P)	**Rayment & Lyons 2011 - 9E2 (Bray 1)	5.4	2.0	7.0	*45 note 8*	*30 note 8*	*24 note 8*	*20 note 8*
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.70	8.66	8.62	*6.5*	*6.5*	*6.3*	*6.3*
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.210	0.384	0.671	*0.200*	*0.150*	*0.120*	*0.100*
	Estimated Organic Matter (% OM)	**Calculation: Total Carbon x 1.75	2.17	1.74	1.54	*> 5.5*	*>4 .5*	*> 3.5*	*> 2.5*
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	28	29	22	*15.6*	*10.8*	*5.0*	*1.9*
	Exchangeable Calcium (kg/ha)		12,656	13,041	9,887	*7000*	*4816*	*2240*	*840*
	Exchangeable Calcium (mg/kg)		5,650	5,822	4,414	*3125*	*2150*	*1000*	*375*
	Exchangeable Magnesium (cmol+/kg)		10	12	9.9	*2.4*	*1.7*	*1.2*	*0.60*
	Exchangeable Magnesium (kg/ha)		2,743	3,242	2,689	*650*	*448*	*325*	*168*
	Exchangeable Magnesium (mg/kg)		1,225	1,447	1,200	*290*	*200*	*145*	*75*
	Exchangeable Potassium (cmol+/kg)		0.90	0.72	0.65	*0.60*	*0.50*	*0.40*	*0.30*
	Exchangeable Potassium (kg/ha)		790	631	573	*526*	*426*	*336*	*224*
	Exchangeable Potassium (mg/kg)		353	281	256	*235*	*190*	*150*	*100*
	Exchangeable Sodium (cmol+/kg)		2.4	4.0	4.6	*0.3*	*0.26*	*0.22*	*0.11*
	Exchangeable Sodium (kg/ha)		1,213	2,079	2,348	*155*	*134*	*113*	*57*
	Exchangeable Sodium (mg/kg)		542	928	1,048	*69*	*60*	*51*	*25*
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	*0.6*	*0.5*	*0.4*	*0.2*
	Exchangeable Aluminium (kg/ha)		<1	<1	<1	*121*	*101*	*73*	*30*
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	*54*	*45*	*32*	*14*
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	*0.6*	*0.5*	*0.4*	*0.2*
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	*13*	*11*	*8*	*3*
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	*6*	*5*	*4*	*2*
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	42	46	37	*20.1*	*14.3*	*7.8*	*3.3*
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	68	64	59	*77.6*	*75.7*	*65.6*	*57.4*
	Magnesium (%)		24	26	27	*11.9*	*11.9*	*15.7*	*18.1*
	Potassium (%)		2.2	1.6	1.8	*3.0*	*3.5*	*5.2*	*9.1*
	Sodium - ESP (%)		5.7	8.8	12	*1.5*	*1.8*	*2.9*	*3.3*
	Aluminium (%)		0.00	0.00	0.00	*6.0*	*7.1*	*10.5*	*12.1*
	Hydrogen (%)		0.00	0.00	0.00				
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	2.8	2.4	2.2	*6.5*	*6.4*	*4.2*	*3.2*
	Total Carbon (%)	Inhouse S4a (LECO Trumac Analyser)	1.24	1.00	0.88	*> 3.1*	*> 2.6*	*> 2.0*	*> 1.4*
	Total Nitrogen (%)		0.06	0.05	0.02	*> 0.30*	*> 0.25*	*> 0.20*	*> 0.15*
	Carbon/Nitrogen Ratio	**Calculation: Total Carbon/Total Nitrogen	20.7	18.8	36.6	*10–12*	*10–12*	*10–12*	*10–12*
	Chloride Estimate (equiv. mg/kg)	**Calculation: Electrical Conductivity x 640	134	246	429	..	..	..	..

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AGRICULTURAL SOIL ANALYSIS REPORT

81 samples supplied by SLR Consulting Australia Pty Ltd on 6/12/2021 . Lab Job No.M4178
Analysis requested by Alex Koeman. Your Job: PO: 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 79	Sample 80	Sample 81	*Heavy Soil*	*Medium Soil*	*Light Soil*	*Sandy Soil*
	Sample ID:	BH39_20-30	BH39_50-60	BH39_90-100				
	Crop:	Soil	Soil	Soil				
	Client:	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	SLR Consulting Australia Pty Ltd	*Clay*	*Clay Loam*	*Loam*	*Loamy Sand*
	Parameter	**Method reference**	**M4178/79**	**M4178/80**	**M4178/81**	**Indicative guidelines - refer to Notes 6 and 8**		

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwo
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil res
10. Conversions for 1 $cmol_+/kg$ = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimat
13. ** NATA accreditation does not cover the performance of this service.
14. Analysis conducted between sample arrival date and reporting date.
15. This report is not to be reproduced except in full. Results only relate to the item tested.
16. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditio
17. This report was issued on 14/12/2021.

Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

Appendix D Emerson Aggregate Test Ratings

Ensham Life of Mine Extension Project – Zone 1

Land Resource Assessment

Ensham Resources Pty Ltd

SLR Project No.: 620.041251.00001

31 January 2025

GRAIN SIZE ANALYSIS (hydrometer and sieving techniques)

81 soil samples supplied by SLR Consulting Australia on 6 December, 2021 - Lab Job No. M4178
Analysis requested by Alex Koeman. Client reference: PO 620.30686
Level 2, 15 Astor Terrace BRISBANE QLD 4000

SAMPLE ID	Lab Code	EMERSON AGGREGATE CLASS	MOISTURE CONTENT (% of water in sample)	TOTAL GRAVEL > 2 mm (% of total oven-dry equivalent)	GRAVEL > 4.75 mm (% of total oven-dry equivalent)	GRAVEL 2.00-4.75 mm (% of total oven-dry equivalent)	COARSE SAND 200-2000 µm (0.2-2.0 mm) (% of total oven-dry equivalent)	FINE SAND 20-200 µm (0.02-0.2 mm) (% of total oven-dry equivalent)	SILT 2-20 µm ISSS (% of total oven-dry equivalent)	CLAY < 2 µm (% of total oven-dry equivalent)	Total soil fractions (incl. Gravel)
BH02_0-10	M4178/1	3	5.4%	1.2%	0.0%	1.2%	35.7%	50.1%	5.0%	8.0%	100.0%
BH02_20-30	M4178/2	3	2.7%	13.7%	7.1%	6.6%	29.7%	21.3%	4.4%	30.9%	100.0%
BH02_50-60	M4178/3	3	6.8%	0.5%	0.0%	0.5%	16.9%	30.3%	4.2%	48.1%	100.0%
BH02_90-100	M4178/4	3	9.3%	2.8%	0.5%	2.3%	38.9%	40.8%	4.7%	12.8%	100.0%
BH03_0-10	M4178/5	4	15.0%	27.2%	12.5%	14.6%	25.1%	20.7%	4.9%	22.1%	100.0%
BH03_20-30	M4178/6	4	9.9%	13.9%	8.2%	5.7%	24.5%	30.9%	4.1%	26.6%	100.0%
BH03_30-40	M4178/7	4	9.3%	21.7%	9.7%	12.0%	17.3%	22.2%	7.9%	30.9%	100.0%
BH04_0-10	M4178/8	3	8.5%	15.1%	7.4%	7.7%	19.6%	40.2%	10.8%	14.3%	100.0%
BH04_15-25	M4178/9	4	6.8%	10.8%	3.7%	7.1%	21.8%	42.1%	11.0%	14.2%	100.0%
BH05_0-10	M4178/10	2	12.1%	1.1%	0.0%	1.1%	2.8%	14.9%	18.7%	62.5%	100.0%
BH05_20-30	M4178/11	2	11.5%	0.6%	0.0%	0.6%	2.7%	16.0%	21.1%	59.5%	100.0%
BH05_50-60	M4178/12	2	14.2%	0.1%	0.0%	0.1%	3.3%	17.5%	27.2%	52.0%	100.0%
BH05_90-100	M4178/13	2	14.5%	0.2%	0.0%	0.2%	5.0%	43.9%	39.2%	11.8%	100.0%
BH08_0-10	M4178/14	3	14.7%	6.2%	1.5%	4.7%	6.4%	22.7%	19.6%	45.1%	100.0%
BH08_20-30	M4178/15	4	13.0%	4.1%	2.1%	2.0%	4.0%	18.1%	21.7%	52.1%	100.0%
BH08_50-60	M4178/16	4	13.7%	3.0%	1.8%	1.2%	2.9%	14.7%	24.1%	55.3%	100.0%
BH08_90-100	M4178/17	3	12.5%	1.9%	0.0%	1.9%	3.7%	17.9%	24.6%	52.0%	100.0%
BH09_0-10	M4178/18	4	12.6%	3.8%	0.0%	3.8%	6.0%	25.6%	22.2%	42.3%	100.0%
BH09_20-30	M4178/19	3	12.6%	3.7%	0.4%	3.3%	7.3%	26.1%	22.5%	40.3%	100.0%
BH09_50-60	M4178/20	3	4.0%	0.4%	0.3%	0.1%	27.3%	47.1%	11.9%	13.4%	100.0%
BH09_90-100	M4178/21	2	9.6%	1.4%	0.0%	1.4%	38.6%	41.7%	11.5%	6.8%	100.0%
BH11_0-10	M4178/22	4	15.3%	3.7%	1.7%	2.0%	25.3%	32.6%	9.6%	28.9%	100.0%
BH11_20-30	M4178/23	2	12.7%	7.6%	4.7%	2.9%	24.7%	39.8%	5.6%	22.3%	100.0%
BH11_50-60	M4178/24	4	10.9%	2.4%	0.6%	1.8%	21.4%	43.9%	8.3%	24.0%	100.0%
BH11_90-100	M4178/25	4	9.5%	2.6%	0.5%	2.0%	20.6%	43.9%	9.4%	23.6%	100.0%
BH12_0-10	M4178/26	3	4.0%	0.6%	0.0%	0.6%	56.5%	33.8%	5.2%	3.9%	100.0%
BH12_20-30	M4178/27	3	5.8%	1.5%	0.0%	1.5%	54.2%	31.2%	4.3%	8.8%	100.0%
BH12_50-60	M4178/28	2	6.5%	3.3%	2.3%	1.0%	47.4%	29.9%	3.8%	15.6%	100.0%
BH12_90-100	M4178/29	2	6.4%	3.1%	0.0%	3.1%	46.3%	28.8%	4.7%	17.2%	100.0%
BH13_0-10	M4178/30	3	2.1%	2.5%	0.0%	2.5%	59.2%	28.5%	1.4%	8.4%	100.0%
BH13_20-30	M4178/31	3	2.2%	3.5%	0.6%	2.9%	57.4%	26.9%	2.0%	10.3%	100.0%
BH13_50-60	M4178/32	3	2.2%	5.1%	1.6%	3.5%	54.3%	24.5%	2.8%	13.3%	100.0%
BH13_90-100	M4178/33	3	3.0%	5.1%	0.4%	4.7%	46.9%	26.2%	2.4%	19.4%	100.0%
BH14_0-10	M4178/34	3	7.5%	5.8%	2.0%	3.8%	41.8%	38.2%	9.2%	5.0%	100.0%
BH14_20-30	M4178/35	3	8.7%	7.2%	5.3%	1.9%	39.1%	38.4%	8.8%	6.5%	100.0%
BH14_50-60	M4178/36	2	17.9%	3.8%	0.0%	3.8%	29.0%	24.7%	19.4%	23.0%	100.0%
BH14_90-100	M4178/37	3	11.1%	2.1%	0.5%	1.6%	31.2%	30.4%	7.3%	29.1%	100.0%
BH16_0-10	M4178/38	4	19.2%	0.2%	0.0%	0.2%	1.2%	18.4%	26.2%	53.9%	100.0%
BH16_20-30	M4178/39	4	19.9%	0.0%	0.0%	0.0%	1.9%	54.0%	36.6%	7.5%	100.0%
BH16_50-60	M4178/40	3	12.5%	0.3%	0.0%	0.3%	2.3%	57.0%	35.5%	4.9%	100.0%
BH16_90-100	M4178/41	3	10.2%	0.1%	0.0%	0.1%	0.9%	53.6%	18.5%	26.8%	100.0%
BH18_0-10	M4178/42	4	17.8%	0.9%	0.0%	0.9%	2.8%	12.2%	29.4%	54.7%	100.0%
BH18_20-30	M4178/43	4	21.1%	0.5%	0.0%	0.5%	2.2%	34.3%	14.2%	48.9%	100.0%
BH18_50-60	M4178/44	4	25.3%	0.1%	0.0%	0.1%	1.2%	5.1%	26.2%	67.5%	100.0%
BH18_90-100	M4178/45	4	22.7%	0.1%	0.0%	0.1%	1.5%	10.8%	24.9%	62.8%	100.0%
BH22_0-10	M4178/46	4	21.9%	0.9%	0.0%	0.9%	1.9%	10.6%	21.5%	65.2%	100.0%
BH22_20-30	M4178/47	4	17.8%	0.6%	0.0%	0.6%	1.4%	17.0%	18.2%	62.8%	100.0%
BH22_50-60	M4178/48	4	21.5%	0.7%	0.0%	0.7%	1.3%	14.9%	18.7%	64.4%	100.0%
BH22_90-100	M4178/49	3	18.4%	0.3%	0.0%	0.3%	1.5%	16.2%	22.0%	60.1%	100.0%
BH26_0-10	M4178/50	4	8.2%	0.8%	0.0%	0.8%	2.4%	30.7%	23.3%	42.8%	100.0%
BH26_20-30	M4178/51	3	17.4%	0.0%	0.0%	0.0%	2.1%	29.5%	17.8%	50.7%	100.0%
BH26_50-60	M4178/52	4	17.5%	0.3%	0.0%	0.3%	3.2%	29.1%	15.9%	51.5%	100.0%
BH26_90-100	M4178/53	3	14.5%	0.3%	0.0%	0.3%	3.6%	51.0%	14.5%	30.5%	100.0%
BH29_0-10	M4178/54	4	17.7%	0.0%	0.0%	0.0%	0.3%	27.6%	21.5%	50.6%	100.0%
BH29_20-30	M4178/55	4	14.5%	0.0%	0.0%	0.0%	0.3%	36.6%	24.2%	38.9%	100.0%
BH29_50-60	M4178/56	4	12.6%	0.0%	0.0%	0.0%	0.4%	38.0%	22.1%	39.4%	100.0%
BH29_90-100	M4178/57	4	10.3%	0.1%	0.0%	0.1%	0.9%	45.4%	14.6%	39.0%	100.0%
BH30_0-10	M4178/58	4	7.8%	0.9%	0.0%	0.9%	3.2%	32.0%	27.2%	36.7%	100.0%
BH30_20-30	M4178/59	4	11.1%	0.4%	0.0%	0.4%	4.3%	53.7%	20.5%	21.1%	100.0%
BH30_50-60	M4178/60	4	8.9%	0.4%	0.0%	0.4%	3.1%	51.8%	26.9%	17.8%	100.0%
BH30_70-80	M4178/61	4	7.4%	2.1%	0.0%	2.1%	2.7%	37.0%	36.4%	21.9%	100.0%
BH32_0-10	M4178/62	3	2.8%	0.1%	0.0%	0.1%	14.0%	64.6%	8.3%	12.9%	100.0%
BH32_20-30	M4178/63	3	5.0%	0.2%	0.0%	0.2%	12.4%	65.7%	8.5%	13.2%	100.0%
BH32_50-60	M4178/64	3	7.0%	0.0%	0.0%	0.0%	4.8%	50.9%	10.4%	33.9%	100.0%
BH32_90-100	M4178/65	4	6.3%	0.1%	0.0%	0.1%	5.0%	58.2%	9.9%	26.9%	100.0%
BH34_0-10	M4178/66	2	3.0%	0.3%	0.0%	0.3%	12.5%	46.6%	16.4%	24.2%	100.0%
BH34_20-30	M4178/67	3	7.4%	0.3%	0.0%	0.3%	10.5%	27.9%	18.3%	43.1%	100.0%
BH34_50-60	M4178/68	2	5.3%	4.9%	1.7%	3.2%	15.4%	31.6%	10.4%	37.7%	100.0%
BH34_90-100	M4178/69	2	9.8%	18.4%	1.4%	17.0%	45.2%	10.3%	7.9%	18.3%	100.0%
BH36_0-10	M4178/70	3	5.3%	2.1%	0.5%	1.6%	20.2%	50.1%	11.8%	15.7%	100.0%
BH36_20-30	M4178/71	2	8.1%	3.1%	1.1%	2.0%	15.6%	48.1%	9.9%	23.3%	100.0%
BH36_50-60	M4178/72	4	9.8%	0.5%	0.0%	0.5%	10.7%	34.3%	4.5%	50.0%	100.0%
BH36_90-100	M4178/73	2	8.7%	0.2%	0.0%	0.2%	8.6%	36.7%	8.2%	46.2%	100.0%
BH38_0-10	M4178/74	3	7.1%	3.7%	1.3%	2.5%	9.9%	35.0%	15.7%	35.6%	100.0%
BH38_20-30	M4178/75	3	10.8%	2.4%	0.0%	2.4%	7.4%	29.9%	17.8%	42.5%	100.0%
BH38_50-60	M4178/76	4	12.3%	0.4%	0.0%	0.4%	1.2%	22.4%	18.8%	57.2%	100.0%
BH38_90-100	M4178/77	2	13.7%	0.0%	0.0%	0.0%	2.1%	31.0%	17.9%	49.0%	100.0%
BH39_0-10	M4178/78	3	15.6%	0.0%	0.0%	0.0%	2.1%	17.3%	21.9%	58.6%	100.0%
BH39_20-30	M4178/79	4	15.6%	0.2%	0.0%	0.2%	2.5%	16.9%	20.8%	59.5%	100.0%
BH39_50-60	M4178/80	3	14.7%	0.6%	0.0%	0.6%	2.4%	18.3%	20.9%	57.8%	100.0%
BH39_90-100	M4178/81	3	13.4%	1.3%	0.0%	1.3%	1.7%	29.3%	16.4%	51.4%	100.0%

Note:

1: The Hydrometer Analysis method was used to determine the percentage sand, silt and clay,
modified from SOP meth004 (California Dept of Pesticide Regulation), using method of Gee & Bauder (1986),
in *Methods of Soil Analysis. Part 1* Agron. Monogr. 9 (2nd Ed). Klute, A., American Soc. of Agronomy Inc., Soil Sci. Soc. America Inc., Madison WI: 383-411.

2: Australian Standard 1289.3.8.1-1997 (see attached)

3. Analysis conducted between sample arrival date and reporting date.

4. This report is not to be reproduced except in full. Results only relate to the item tested.

5. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal).

6. This report was issued on 06/01/2022.

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checked: .....
Graham Lancaster (Nata signatory)
Laboratory Manager

Appendix E Land Suitability and Agricultural Land Classification

Ensham Life of Mine Extension Project – Zone 1

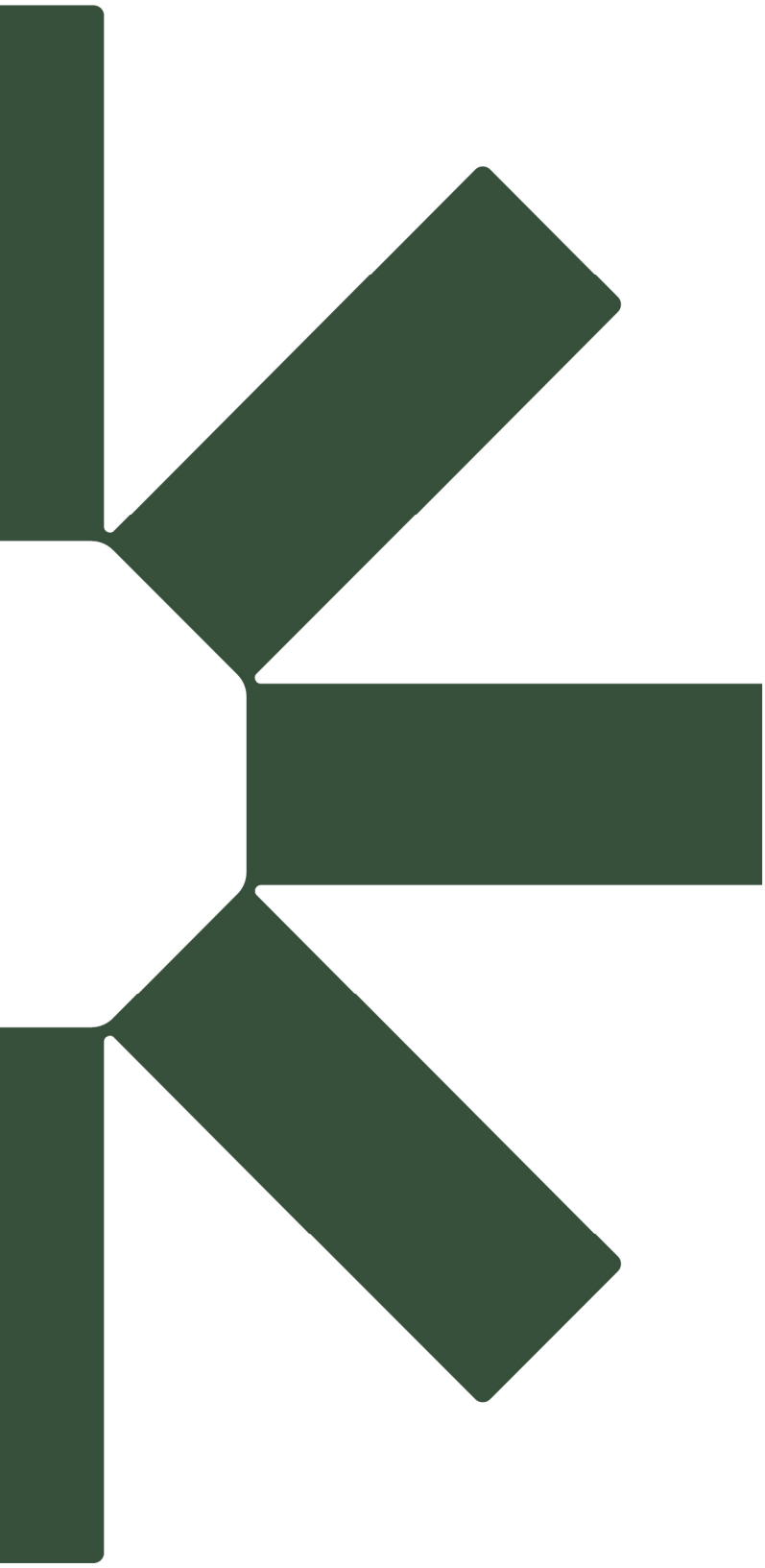
Land Resource Assessment

Ensham Resources Pty Ltd

SLR Project No.: 620.041251.00001

31 January 2025

Soil Map Unit	Dominant Soil Type	Land Suitability Class Cropping	Land Suitability Class Grazing	Agricultural Land Class
1A	Crusty Brown Vertosols	4	2	A2
1B	Crusty Brown Vertosols	5	3	C2
2A	Eutrophic Brown Dermosols	5	3	C2
2B	Eutrophic Brown Dermosols	5	3	C2
2C	Eutrophic Brown Dermosols	5	5	C3
3	Clastic Rudosols	5	5	C4



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