Soil and Land Resource Assessment Report

Daunia West Infrastructure Project

Whitehaven Daunia Pty Ltd

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Basis of Report

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

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Acronyms and Abbreviations

%	Percent
°C	Degrees Celsius
ARI	Areas of regional interest
ASRIS	Australian Soil Resource Information System
ASC	Australian Soil Classification
BoM	Bureau of Meteorology
BMA	BM Alliance Coal Operations Pty Ltd
cm	centimetres
CCP	Community Consultation Plan
CEC	Cation exchange capacity
CHPP	Coal Handling and Preparation Plant
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DNM	Daunia Mine
DNRM	Department of Natural Resources and Mines
DSITIA	Department of Science, Information Technology, Innovation, and the Arts
EA	Environmental Authority
EAT	Emerson aggregate test
EC	Electrical conductivity
EP Act	*Environmental Protection Act 1994* (Qld)
EPBC	Environment Protection and Biodiversity Conservation
EPBC Act	*Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*
EPC	Exploration permits for coal
ESC	Erosion and Sediment Controls
ESP	Exchangeable sodium percentage
ES	Erosion hazard, subsoil erodibility
FY	Financial Year
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectares
IPDs	In-Pit Dumps
km	kilometre
km^2	Squared kilometre
m	meters
mm	millimetres
m bgl	Metres below ground level

m AHD	Metres Australian Height Datum
ML	Mining Lease
MLs	Mining Leases
MLA	Mining lease application
Mtpa	Million tonnes per annum
NATA	National Association of Testing Authorities
NCST	National Committee on Soil and Terrain
NUMAs	non-use management area
OOPD	Out of Pit Spoil Dumps
QLD	Queensland
pH	potential of hydrogen
PAA	Priority Agricultural Areas
PLA	Priority Living Area
PRCP	Progressive Rehabilitation and Closure Plan
PSA	Particle size analysis
PMLU	Post-mining land use
ROM	Run-of-Mine
RPI Act	*Regional Planning Interests Act 2014* (Qld)
SCA	Strategic Cropping Area
SCL	Strategic Cropping Land
SEA	Strategic Environmental Area
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SMU	Soil Map Units
SPC	Soil Profile Class
SLR	SLR Consulting Australia Pty Ltd
TLF	Train Loadout Facility
WHC / the Client	Whitehaven Daunia Pty Ltd

Executive Summary

Whitehaven Daunia Pty Ltd (WHC) commissioned this Soil and Land Resource Assessment to evaluate the potential impacts of the proposed Out-of-Pit Dump (OOPD) associated with the Pandora Pit development at the Daunia Mine in Central Queensland. The assessment was undertaken by SLR Consulting Australia Pty Ltd in accordance with Queensland Land Resources Assessment Guidelines, agricultural land evaluation frameworks, and relevant legislation including the *Environmental Protection Act 1994 (Qld)* and *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*.

The study combined desktop review, soil surveys, laboratory analyses, and land suitability assessments to establish baseline conditions and predict the potential impacts of the proposed mining activities on soil and land resources.

The Project Area is dominated by Epipedal Black-Brown Vertosols and Palic Brown Arenosols, with topsoils generally neutral, non-saline, and moderately fertile. Subsoils exhibit variable sodicity and moderate dispersive potential, which present erosion risks if not managed appropriately.

Soils have moderate dispersive potential, with Emerson Aggregate Test results of Class 3–4. Subsoil sodicity and low organic matter increase susceptibility to erosion, requiring stringent erosion and sediment controls (ESC) during disturbance, stockpiling and rehabilitation.

Approximately 824,276 m^3 of topsoil can be recovered for reuse from the Project Area Disturbance Footprint.

Rehabilitation will focus on achieving a safe, stable, non-polluting, and sustainable landscape with cattle grazing as the Post-Mining Land Use (PMLU).

Pre-mining Cropping Land Suitability is Class 4 (moderately suitable) and Class 5 (unsuitable), primarily limited by soil water availability and wetness. Agricultural Land Class assessments identified predominately C1 and C2 (pasture land), supporting grazing as the dominant sustainable land use. Pre-mining Grazing Suitability was classified as Class 4 and Class 5, with nutrient deficiency and soil water availability identified as the dominant limiting factors.

The report outlines rehabilitation methodologies including soil sourcing and placement, erosion and sediment control, and vegetation establishment. Proper handling of sodic subsoils, topsoil conservation, and progressive rehabilitation will be critical to ensure successful and sustainable rehabilitation.

1.0 Introduction

1.1 Background and Overview of the Project

Whitehaven Daunia Pty Ltd (hereafter referred to as WHC or the Client) owns and operates the Daunia Mine (DNM) situated approximately 25 kilometres (km) southeast of Moranbah in Central Queensland, on Mining Leases (ML) 1781, ML 70115, and ML 70116. The DNM operates under Environmental Authority (EA) EPML00561913, dated 29 June 2023 and Environment Protection and Biodiversity Conservation (EPBC) approval 2008/4418 on ML 1781, ML 70115 and ML 70116 (refer to **Figure 1-1, Appendix A**). The DNM was approved with conditions on 26 October 2009 by the Coordinator-General, under the State Development and Public Works Organisation Act 1971 (SDPWO Act).

The DNM is located approximately 2 km north of the Isaac River and 15 km south of the Peak Downs Highway. The existing mining activities at DNM occur on ML 1781, ML 70115 and ML 70116 are presented in **Figure 1-2, Appendix A**.

The DNM is an open-cut mining operation that utilises a truck and shovel fleet, producing a hard coking coal product for the export market. It produces up to 6.1 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal and has a production capacity of 4.9 Mtpa of product metallurgical coal. The DNM is approved for a 30-year mine plan covering defined multi-seam extents commencing in 2013 and scheduled to end in FY2041.

WHC proposes the construction and operation of an OOPD to the west of, and adjacent to, ML 1781, off-lease from DNM (the Project). The Project is required to support ongoing open-cut mining in the Pandora Pit, which contains the 'Pandora' resource, one of the remaining undeveloped resources within the DNM. The Pandora resource is located within ML 1781 at the southern extent of the ML. The proximity of this resource to the ML boundary, along with limited available space within the existing MLs, necessitates the development of supporting infrastructure outside the current MLs. Considering this, the Project will also require the construction of additional haul roads to transport material from the Pandora pit to the short haul OOPD. The Project will be constructed on EPC27334 which will be converted into a ML as part of this approval and will utilise existing infrastructure while continuing current operations at DNM (refer to **Figure 1-2, Appendix A**).

The Mining Lease Application (MLA) for the Project is located to the west of and adjacent to ML 1781, this MLA area also forms the Project Area footprint. The Project Area covers an approximate area of 500 hectares (ha) which consists of 305 ha proposed future disturbance and 195 ha that is not proposed to be disturbed (**Table 1-1**). The OOPD footprint is proposed to disturb 282 ha. The proposed OOPD comprising a maximum height of 250 m AHD will provide a dedicated area for the overburden material to accommodate the open-cut mining operations in line with the proposed 6.5 Mtpa ROM production capacity. Additional disturbance within the Project Area is proposed for a mine-affected water dam, sediment dam and haul roads.

Table 1-1 Area of Investigation

Area of Investigation	Area (hectare)
Total Project Area (ML Application Area)	**500**
Undisturbed Footprint within Project Area	195
Disturbance Footprint within Project Area	305
→ OOPD within Project Area	282
→ Mine-Affected Water Dam	14
→ Sediment Dam	4
→ Haul Road	4
Total area for rehabilitation	**305**

1.2 Purpose

The purpose of this report is to provide an assessment of impacts to the soil and land resources within the Project Area. The soil and land resource assessment was completed in line with the relevant standards and guidelines (refer to **Section 1.3**) and the following tasks were completed:

- Background, set-up, and preparation of a sampling plan.
- Undertaking health and safety preparation and inductions.
- Completion of fieldwork for soil and land resources assessment.
- Submission of collected soil samples from the fieldwork to the laboratory for testing.
- Review of laboratory results for interpretation and preparation of a soil and land resource assessment report for the Project.

The soil and land resource assessment involved a soil survey and assessment to:

- Identify relevant regulatory matters.
- Summarise the existing environmental values.
- Summarise previous investigations.
- Evaluate soil survey results, soil characteristics/descriptions & classifications and identification of soil map units.
- Description of soil resources.
- Land resource impact assessment for land suitability, agricultural land classes and grazing suitability.

1.3 Relevant Guidelines, Standards and Regulatory Guidelines

The following guidelines, standards, and regulatory guidelines were used for the Soil and Land Resource Assessment:

- McKenzie*, et al.*, (2002). Soil Physical Measurement and Interpretation for Land Evaluation. CSIRO Publishing.
- Department of Natural Resources and Minerals (DNRM) and Department of Science, Information Technology, Innovation, and the Arts (DSITIA), (2013). Regional Land Suitability Frameworks for Queensland. Queensland Government, Brisbane, Queensland.

- Department of Science, Information Technology, and Innovation (DSITI) and DNRM, (2015). Guidelines for agricultural land evaluation in Queensland (Second Edition). Queensland Government, Brisbane, Queensland.
- Department of Environment and Science (DES) and Department of Resources (DOR), (2021). Queensland Land Resources Assessment Guidelines, Volume 1: Soil and Land Resource Assessment.
- Department of Environment and Science (DES) and Department of Natural Resources, Mines and Energy (DNRME), (2020). Queensland Land Resources Assessment Guidelines, Volume 2: Field Tests, Objectives.
- DOR (2021). Queensland Soil and Land Resource Survey Information Guideline VEG/2018/4460. Version 2.00. (Updated 22/02/2021).
- Environmental Protection Act 1994 (Qld) (EP Act).
- Environmental Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act).
- Isbell, R. F., and NCST (2021), The Australian Soil Classification. Third Edition. Melbourne: CSIRO Publishing.
- McKenzie, N.J., Grundy, M.J., Webster, R., Ringrose-Voase, A.J., (2008). Guidelines for Surveying Soil and Land Resources, 2nd edition, National Committee on Soil and Terrain (NCST) Australia.
- NCST, (2024), Australian Soil and Land Survey Field Handbook, Fourth edition. Commonwealth Scientific and Industrial Research Organisation (CSIRO) Publishing.
- Rayment & Lyons, (2011). Soil Chemical Methods – Australasia. Melbourne: CSIRO Publishing.
- Regional Planning Interests Act 2014 (Qld) (RPI Act).
- Short ,T.A., (2023). Rehabilitated mined land suitability for beef cattle grazing in the Bowen Basin: Technical Paper 1. Brisbane: Queensland Mine Rehabilitation Commissioner, Queensland Government.
- State Development Public Works Organisation Act 1971 (SDPWO Act 1971).

2.0 Methodology

2.1 Desktop Review

A desktop assessment was undertaken to establish background information on the baseline soil and land resources within the Project. Various sources have been reviewed during the desktop assessment, including, but not limited to:

- Australian Soil Resource Information System (ASRIS).
- Bureau of Meteorology (Australian Government, 2025).
- Commonwealth Scientific and Industrial Research Organisation (CSIRO) land systems.
- Queensland Globe (2025).
- Terrain-based mapping images including contour information.
- Soil and Landscape Grid of Australia.
- Story et al., (1967). Land of the Isaac-Comet Area, Queensland.
- Thwaites, R.N. and Maher, J.M. (eds.) (1993), Understanding and Managing Soils in the Central Highlands, Department of Primary Industries Training Series QE93002, Brisbane.

Geology mapping, vegetation mapping, satellite imagery and aerial photos were also used as inputs prior to undertaking the fieldwork component of the assessment.

2.2 Areas of Regional Interest

The *Regional Planning Interests Act 2014* (Qld) (RPI Act) identifies and protects areas of regional interest from inappropriate resource activity or regulated activity. Areas of Regional Interest (ARI) identified in the RPI Act include Priority Agricultural Areas (PAA), Priority Living Area (PLA), Strategic Environmental Area (SEA), and Strategic Cropping Area (SCA).

Relevant ARI to land resources is SCA and PAA. SCA consists of Strategic Cropping Land (SCL) as identified in the SCL trigger map and deemed as suitable and available for current and potential future cropping with limitations to production that range from moderate to none. A PAA is an area considered highly productive agricultural land by the relevant regional council under a regional plan. The Project does not intercept any ARI (see Areas of Regional Interest – Desktop Study, **Appendix B** (Queensland Globe, 2025).

2.3 Sampling Program and Assessment

2.3.1 Sampling Program

The field soil sampling program was designed as an integrated free survey. An integrated free survey assumes that many land characteristics are interdependent and tend to occur in correlated sets (NCST, 2009). Survey locations were located based on desktop studies and site observations to aid the delineation of soil boundaries for a qualitative land resource survey. Soil boundaries can be abrupt or gradual, and catena and toposequences are used to aid the description of gradual variation.

Soil survey sites were completed at a rate to satisfy the cartographic scale requirements as per the Guidelines for Surveying Soil and Land Resources (McKenzie *et al.,* 2008) and the Queensland Soil and Land Resource Survey Information Guideline (QLD Department of Resources, 2021). The soil survey incorporated a scale of 1:100,000. Soil profiles were assessed and described in accordance with the Australian Soil and Land Survey Field

Handbook (NCST, 2009). The applicable technical standard for naming the units of soil identified is the Australian Soil Classification (ASC) system (Isbell, 2021).

Three types of observations were used for the soil survey:

- Detailed sites, which are observations sites that allow for the identification of any physiographic factors or vegetation associations that characterise the site and associated map unit, along with the major pedological feature of the soil profile. Soil profiles were manually excavated using a hand auger to a maximum depth of 1.0 metre below ground level (m bgl).
- Analysed sites, which are detailed sites from which soil samples are collected and sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis to confirm key soil characteristics and soil type.
- Check sites, which are mapping observations examined in sufficient detail to allocate the site to a specific soil type and map unit.

An initial field sampling program was undertaken by SLR in 2021, where 3 detailed sites and 8 check sites were evaluated to confirm soil type and aid in soil mapping. In November 2023, a second field sampling program was undertaken where 2 additional detailed sites were assessed, with soil samples taken from each site. In total, 5 detailed sites were assessed, of which 4 were lab analysed, and 8 check sites were assessed.

It should be noted that the proposed Project Area and OOPD have been amended since field investigations were undertaken. Based on existing site information, additional fieldwork have not been undertaken during 2025. The survey density based on the current proposed Project Area and proposed OOPD is 1 site per 100 ha, which complies with a 1:100,000 survey scale. The distribution of the field assessment sites is shown in **Figure 2-1, Appendix A.**

2.3.2 Soil Assessment

Soil profiles within the study area were assessed in accordance with the Australian Soil and Land Survey Field Handbook (NCST, 2009) soil classification procedures. Detailed soil profile descriptions were recorded covering the major parameters provided in **Table 2-1**.

Table 2-1 Field Assessment Parameters

Detailed Field Assessment Parameters	
Horizon depth including horizon boundaries	Pan presence and form (if encountered)
Field texture grade	Permeability and drainage
Field colour (Munsell colour chart)	Field pH
Pedality structure, grade and consistence	Field moisture
Coarse fragments (abundance, size and lithology)	Surface condition
Mottles (abundance, contrast and colour)	Landform element
Segregations (nature, form and size)	Landform pattern
General information (site type, observation type, observation class, project, Site ID, SPC, ASC)	Vegetation
Microrelief	Current land use
Rock outcrop and surface coarse fragments (abundance and size)	Slope (%) and slope type

Soil profile logging was undertaken in the field using SLR soil data sheets, including Global Positioning System (GPS) recordings and photographs of the landforms and soil profiles. Soils were classified in accordance with The Australian Soil Classification (Isbell, 2021).

Full laboratory testing was undertaken for 4 of the detailed sites and typical sample depths were 0-10, 20-30, 50-60 and 90-100 centimetres (cm) below ground level. Sampling intervals were adjusted if they crossed a major soil horizon. Laboratory analysis was performed by Environmental Analysis Laboratory 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) (1:5 water).
- Chloride.
- Cation exchange capacity (CEC).
- Exchangeable sodium percentage (ESP).
- Nitrate Nitrogen (selected samples).
- Total Nitrogen.
- Total Phosphorus.
- Particle size analysis (PSA).
- Emerson aggregate test (EAT).

Soil salinity in the laboratory analysed samples was determined through the measurement of the EC of 1:5 soil: water suspensions. These values were converted to the EC of a saturated extract based on soil texture (Hazelton and Murphy, 2025). Laboratory certificates of analysis and the chain of custody form from the field investigations (undertaken in 2021 and 2023) are shown in **Appendix C**.

3.0 Existing Environment Values

3.1 Climate

The Bureau of Meteorology (BoM) operates the rainfall for the nearest meteorological station at Iffley Station (BoM Station 034100), located approximately 20 km south-east of the Project. The annual average rainfall (1998 – 2022) is 548.3 millimetres (mm), with most rain occurring between December and February. More recent information has been obtained from Moranbah Airport (BoM Station 034035), located approximately 23 km west of the Project for a period between February 2012 and May 2025, with the annual average rainfall being reported as 559.8 mm. Older information has been obtained from Moranbah Water Treatment Plant (BoM Station 034038), located approximately 26 km north-west of the Project for a period between April 1972 and March 2012, with an annual average rainfall being reported as 613.0 mm.

The average monthly rainfall for Iffley Station, Moranbah Airport and Moranbah Water Treatment Plant is presented in **Table 3-1.** A graph showing the average temperature and rainfall for Moranbah Airport is shown on **Figure 3-1**.

The average maximum temperature ranges from 24°C in June/July to 35°C in December/January, whilst the average minimum temperature ranges from 9°C in July to 22°C in January/February.

The evaporation rate is highest in the summer months, with the mean daily rate of 8.5 mm in December and is typically lowest in the cooler months, with the mean daily rate of 3.5 mm in June. The annual average rate of evaporation is approximately 2,300 mm, which significantly exceeds the annual rainfall and is characteristic of semi-arid environments.

Table 3-1 Average Monthly Rainfall

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
034100	97.4	83.5	57.8	37.3	16.9	37.3	22.1	36.3	15.4	35.3	56.5	88.0	548.3
034035	104.1	92.9	80.7	32.0	30.6	23.1	35.9	13.9	13.3	24.6	66.2	61.4	559.8
034038	103.8	100.7	55.4	36.4	34.5	22.1	18.0	25.0	9.1	35.7	69.3	103.9	614.2

[1] Iffley Station (34100) (1998 – 2023) (after BoM, 2025)
[2] Moranbah Airport (34035) (2012 – 2025) (after BoM, 2025)
[3] Moranbah Water Treatment Plant (1972 – 2012) (after BoM, 2025)

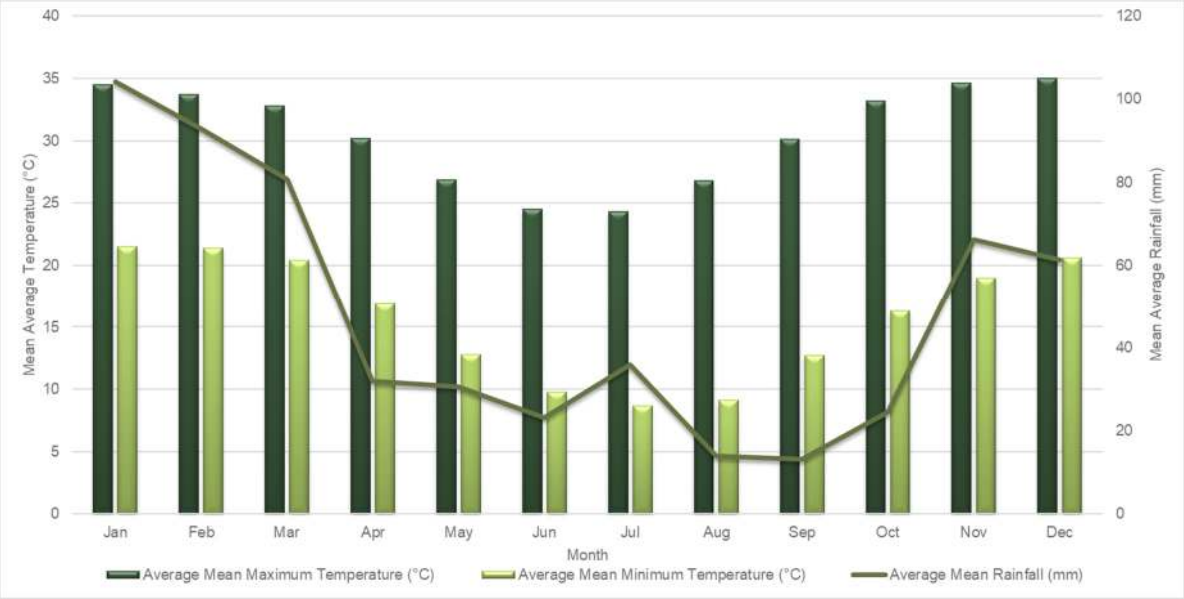

Figure 3-1 Average Monthly Mean Temperature and Rainfall Data from Moranbah Airport (34035) (2012 – 2025) (after BoM, 2025)

3.2 Geology

The Project is situated in the northern region of the Bowen Basin, which is a north-south trending basin divided into broad morphotectonic zones. The Bowen Basin is characterised by gentle easterly dips and minor to moderate deformation on a relatively thin accumulation of sediments. The sediments and stratigraphic sequence were formed by the Permo-Triassic sediments of the Bowen Basin, which are overlain by a range of Tertiary and Quaternary sediments and alluvium (TQa and Qa respectively). The Project occurs in the northern part of the basin, with the Fort Cooper (Pwt) and Rangal Coal Measures (Pwj), Tertiary alluvial deposits (TQa) and Quaternary alluvial deposits (Qa) as shown on **Figure 3-2, Appendix A.**

Tertiary and Quaternary sediments within the Project are generally comprised of a thin layer of alluvial sediments thickening (>5 meters (m)). The Fort Cooper (Pwt) and Rangal Coal Measures (Pwj) comprise of interbedded and banded labile sandstones, siltstones, carbonaceous mudstone, and tuffaceous claystone which are interbedded in parts with coal bands and seams.

3.2.1 Regional Geology

DNM is located in the northern part of the Bowen Basin, a foreland sedimentary basin of approximately 200,000 km^2. The Bowen Basin is orientated north-northwest to south-southeast and contains the largest coal reserves in Australia. The southern half of the Bowen Basin is covered by the Surat Basin, and the Galilee Basin is present to the west.

Basin geology within the Collinsville Shelf includes the basal Permian aged Back Creek Group, which generally comprises of generally fine-grained clastic sedimentary rocks deposited in a fluvial to shallow marine environment. The Back Creek Group is conformably overlain by the Blackwater Group, which includes the Moranbah Coal Measures, Fort Cooper Coal Measures and Rangal Coal Measures. The economic seams at DNM are contained in the Rangal Coal Measures. The Permian strata occur as outcrops on the eastern and western edges of the Basin and are unconformably overlain by the Triassic aged consolidated sedimentary rocks of the Rewan Group.

The Permian and Triassic units are covered by a thin veneer of unconsolidated to semi-consolidated Cenozoic sediments (Tertiary to Quaternary alluvium and colluvium). The alluvial sediments are localised along rivers and creeks (i.e., Isaac River). Volcanic intrusions and extrusions are also present within the region.

The generalised regional stratigraphy is summarised in **Table 3-2**. The surface geology is shown in **Figure 3-2, Appendix A** and is based on the Clermont (SF5511) and St Lawrence (SF5512) 1:250,000 geological maps, as compiled within the Queensland Geology Detailed Surface Mapping (DNRME, 2017).

Table 3-2 Regional Stratigraphy

Period		Stratigraphic Unit		Description	Max Thickness (m)
Cenozoic		Isaac River Quaternary alluvium (Qa)		Flood plain alluvium comprising clay, silt, sand, and gravel.	~ 50
		Regolith - alluvium, colluvium and other sediments in floodplains, alluvial fans, and high terraces (Qr, Qr\b and TQa)		Colluvial and residual deposits comprising poorly sorted clay, silt, sand, gravel and black soils, silts and muds derived from weathered basalts.	~ 20
		Suttor Formation (Tu)		Mudstone, sandstone, conglomerate, siltstone, oil shale, lignite, and basalt.	~100
Triassic		Mimosa Group	Clematis Group (Re)	Cross-bedded quartz sandstone, some quartz conglomerate and minor red-brown mudstone.	~100
			Rewan Group (Rr) (Rewan Formation and Sagittarius Sandstone)	Rewan Formation: green lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanolithic pebble conglomerate (at base). Sagittarius Sandstone: lithic sandstone interbedded with mudstones and siltstones with scattered carbonaceous plant material.	~840
Permian	Late	Blackwater Group	Rangal Coal Measures (Pwj)	Coal seams, carbonaceous shale and mudstone, tuff, siltstone, and mudstone.	~200
			Fort Cooper Coal Measures (Pwt) (Fair Hill Formation)	Coal, brown and green sandstone, conglomerate, carbonaceous shale, tuff.	~350
			Moranbah Coal Measures (Pwb)	Quartzose to sublabile locally argillaceous sandstone, siltstone, mudstone, carbonaceous mudstone, and coal.	~ 400
	Early to Middle	Back Creek Group (Pb)		Quartzose to lithic sandstone, siltstone, carbonaceous shale, minor coal and sandy coquinite.	~400

3.2.2 Local Geology

Cenozoic Sediments

Surface geology mapping indicates that Tertiary-Quaternary sediments are present across the area of Pandora Pit, the OOPD, and along the flood plain of the Isaac River. These deposits typically comprise unconsolidated clay, silt, sand, and gravel and are generally less than 20 m in thickness. Detailed information on the nature and thickness of the Tertiary-Quaternary sediments between Pandora Pit, the OOPD and the Isaac River (and the base of weathering) is currently limited.

Isaac River Alluvium (Quaternary)

Quaternary alluvium is present along the course of the Isaac River in broad tract between 1.5-2 km wide to the south-west of DNM and becoming wider downstream. This flood-plain alluvium typically comprises clay, silt, sand and gravel (**Figure 3-2, Appendix A)** symbolised as Qa, and is typically less than 20 m thick.

Quaternary and Tertiary Alluvium

Surface geology mapping indicates that the surficial material covering the area of Pandora Pit and the OOPD comprises Tertiary-Quaternary deposits (TQa) of unconsolidated to partially consolidated sediments comprising sand, silt, clay and minor gravel. These are older high-level alluvial deposits.

Triassic Strata

The Triassic aged strata include the Rewan Group (Rr), which unconformably overlies the Permian coal measures to the east of DNM. It also subcrops to the west of DNM because of faulting and deformation of the Permo-Triassic strata. The Rewan Group comprises Late Permian to Early Triassic strata with pebbly lithic sandstone, green to reddish brown mudstone and minor volcanolithic pebble conglomerates. The Rewan Group is generally absent in the DNM Area, only sub cropping on the northeastern boundary of the DNM mining lease.

Permian Coal Measures (Blackwater Group)

Permian coal-bearing sedimentary rocks of the Blackwater Group form the main economic resource of the numerous mines located in the Project Area. In order of increasing age (top to bottom), the major coal measures in the Project Area are:

- Rangal Coal Measures (Pwj).
- Fort Cooper Coal Measures (Pwt).
- Moranbah Coal Measures (Pwb).

Rangal Coal Measures

Coal resources at DNM are contained within the 100 m thick Rangal Coal Measures (Pwj), which is underlain by the Fort Cooper Coal Measures (Pwt) and overlain in places by the Rewan Group. The Late Permian Rangal Coal Measures comprise light grey, cross-bedded, fine to medium grained labile and well cemented sandstones, grey siltstones, mudstones, shale and coal seams.

The Leichhardt and Upper Vermont Seams within the Rangal Coal Measures are the target seams at DNM. The Leichhardt Seam (DL1) is typically 5 m thick and the Upper Vermont Seam (DV4) typically 3.5 m thick at DNM. These two seams are separated by approximately

10 m – 35 m of siltstone and sandstone interburden. In the north of DNM, the Upper Vermont Seam splits into upper and lower plies (DV2 and DV1 respectively).

3.3 Topography

The topographic elevations in and around the Project range from approximately 180 meters Australian Height Datum (mAHD) (southern end of the Project) to 205 mAHD (at the northern end of the Project) as depicted in **Figure 3-3, Appendix A**. Most of the Project is situated on gently undulating lowlands and plains with slopes of 0% to 6% as depicted in **Figure 3-4, Appendix A**.

The Project lies within the Fitzroy Basin and Issac River sub-basin. Watercourses within the Project are presented **Figure 3-3, Appendix A.** Watercourses are ephemeral and include the Isaac River to the south of the Project, with tributaries, and the New Chum Creek to the west of the Project, with tributaries. North Creek is seen further east and downstream of the Issac River.

3.4 Vegetation and Land-Use

Based on an Isacc-Comet Area map produced originally by Division of Land Research (1967), the vegetation within the Project is predominately underlain by scrub or mixed scrub woodland, and savannah woodland with eastern mid-height grasses is present in the southern portion of Project (see **Figure 3-5, Appendix A)**. Most of the pastureland within the Project is described as Pastureland 10 – Scrub grasses, some eastern mid-height grasses on lowlands. To the south of the Project, the pastureland is described as Pastureland 7 – Eastern mid-height grasses, some downs on lowlands (Division of Land Research,1967).

Based on the ecology report (SLR, 2025), four (4) threatened ecological communities, as defined under the EPBC Act, were identified as potentially occurring within 20 km of the Project. These were:

- Brigalow (Acacia harpophylla dominant and co-dominant) (EPBC endangered).
- Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin (EPBC endangered).
- Poplar Box Grassy Woodland on Alluvial Plains (EPBC endangered).
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (EPBC endangered).

Prior to mining, DNM had been largely cleared of native vegetation and was being utilised for cattle grazing pastures, resulting in extensive cover of buffel grass. Small areas of remnant vegetation in very poor condition remained as fragmented patches (SKM, 2008).

3.5 Land Systems

Three (3) land systems occur within the Project Area ; the Humboldt, Connors, and Girrah (see Land Resource Mapping – Desktop Study, **Appendix B** (Queensland Globe, 2025). The Humboldt land system (which is the majority of the Project Area) is dominated by plains and lowlands on acidic clay, frequently gravelly; texture-contrast soils with brigalow and blackbutt (Story *et. al,* 1967). The land system coverage of the Project and a brief description of attributes is presented in **Table 3-3** and is shown in **Figure 3-6.**

Table 3-3 Land Systems in the Project Area

Land System	Land System Description	Project Area (ha)	Project Area (%)
Humboldt	Blackbutt and brigalow on acidic clay plains and lowlands occurring in most parts of the project; texture-contrast and cracking clay soils.	492	98
Connors	Savannah woodland of box on higher alluvial plains, terraces, or sandy levees not extensively flooded occurring in the south of the project; texture-contrast soils.	5	1
Girrah	Downs and brigalow on lowlands and plains on shale occurring in the east of the project; cracking clay soils.	3	1
	Total	**500**	**100**

The Agricultural Land Class Assessment for the Project Area is predominately C1. A1 is mapped to the south-east of the Project, with C3 to the south of the Project (Queensland Globe, 2025).

The grazing land management types for the Project Area is predominantly mapped as Mountain coolibah woodlands (Queensland Globe, 2025). To the south of the Project, Box country and Brigalow / gidgee scrubs is mapped and to the south-east of the Project, loamy alluvials and Downs.

3.6 Land Degradation (Erosion)

Desktop mapping with Queensland Globe (2025), **Appendix B** shows that gully density mapping is between 11-30 towards north of the Project Area and within the proposed OOPD. Towards the south of the Project and within the proposed OOPD, this reduces to 1-10. Based on gully and channel erosion presence mapping, some channel erosion is noted to be present towards the north of the Project Area and within the proposed OOPD

3.7 Existing Soil Mapping Data

The majority of the Project and proposed OOPD area is classed as “Sodosols” based on the ASC (Australian Soil Classification (ASC) – Desktop Study, **Appendix B** (Queensland Globe, 2025). Vertosols are mapped to the south-east of the Project**.**

The soil mapping from Atlas of Australian Soils Queensland mapped at a broader, regional scale (1:2,000,000) shows that the area is mapped as “MM7” and is described as “Brown and red self-mulching cracking clays”, and can be described with a soil description of “Uniform fine cracking, smooth faced peds, brown clay horizon redder than 1.5 m deep”. The landform is described as “Moderate to gently undulating lowlands and plains”.

Based on previous studies undertaken by Story *et.al.* (1967), the existing soil mapping indicates that the Project Area and proposed Disturbance Footprint is underlain by texture-contrast soils classed as “Deep, with thin sandy or loamy surface soils”, and “Deep, with thick sandy surface soils” and towards the south of the Project and proposed OOPD is described as cracking clay soils described as “Mainly on tertiary weathered zone”.

4.0 Soil Survey Results

4.1 Soil Classification and Description

Based on the studies undertaken by SLR in 2021 and 2023 (refer to **Section 2.3**), the field assessment and subsequent laboratory analysis indicates 2 dominant Soil Map Units (SMU)

within the Project Area. The SMU's are presented in **Figure 4-1, Appendix A.** The dominant soil types per SMU are shown in **Table 4-1** for the Project Area and proposed Disturbance Footprint.

The dominant soil types within the Project Area are an Epipedal Black-Brown Vertosol and a Palic Brown Arenosol. One sub-dominant soil type was found within the Black-Brown Vertosol SMU, being a Sodic Eutrophic Black Chromosol with 24% clay content in the A horizon. Detailed profile descriptions are presented in **Appendix D** with check site descriptions in **Appendix E**.

Table 4-1 Soil Map Units within Project Area

SMU	Dominant Soil Type	Project Area		Disturbance Footprint	
		Area (ha)	Percentage	Area (ha)	Percentage
1	Epipedal Black-Brown Vertosol	413	83	302	99
2	Palic Brown Arenosol	87	17	3	1
	Total	**500**	**100**	**305**	**100**

The soil orders associated with each SMU and detailed and check sites per SMU are summarised in **Table 4-2.**

Table 4-2 Field Investigation Sites

SMU	ASC Soil Type	Soil Type Group	Detailed Site	Check Site
1	Epipedal Black-Brown Vertosol	Dominant	HA01, HA02, HA14	C01 – C07, C12
	Sodic Eutrophic Black Chromosol	Sub-Dominant	HA03	Nil
2	Palic Brown Arenosol	Dominant	HA13	Nil

4.1.1 Vertosols

Vertosols are clay soils which have shrink-swell properties that exhibit strong cracking when dry, and at depth, have slickensides and/or lenticular peds. Although many soils exhibit gilgai microrelief, this feature is not used in their definition. Vertosols are described as soils which have all of the following characteristics:

- A clay field texture or 35 % or more clay throughout the solum except for thin, surface crusty horizons 30 mm or less thick.
- 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.
- Slickensides and/or lenticular peds occur at some depth in the solum.

The Vertosol mapped within the Project Area is an Epipedal Black-Brown Vertosol.

Sub-Dominant Soil Type – Chromosol

Chromosols are described as soils other than Hydrosols with a clear or abrupt textural B horizon and in which the major part of the upper 0.2 m of the B2t horizon (or the major part of the entire B2t horizon if it is less than 0.2 m thick) is not sodic and not strongly acid. These

are described as soils with strongly subplastic upper B2t horizons are also included even if they are sodic.

The Chromosol found within the Epipedal Black-Brown Vertosol SMU was a Sodic Eutrophic Black Chromosol.

4.1.2 Arenosols

Arenosols are soils that have, within the upper 1.0 m of the soil profile:

- A sandy field texture (i.e. a field texture of sand, loamy sand or clayey sand) in one or more layers or horizons with a combined thickness of at least 0.8 m.
- No layer or horizon with a clay content that exceeds 15% (i.e. heavy sandy loam [SL+] or heavier) excluding argic horizon/s.
- ≤10% (by visual abundance and weighted average) of coarse fragments and/or hard segregations >2 mm in size.
- No hard layers (cemented pans, other cemented materials, rock, saprock or saprolite that do not soften when moist).

The Arenosol mapped within the Project Area is a Palic Brown Arenosol.

4.2 Soil Characterisation

The complete laboratory results and chain of custody are shown in **Appendix C.**

The suitability of soil within the Project Area has been determined by reviewing the key soil properties, such as soil pH, salinity, sodicity and plant available nutrients against the criteria set out in *Interpreting Soil Test Results* (Hazelton & Murphy, 2025). A summary of the soil properties is discussed below.

The topsoils range in thickness from 10 to 40 cm, and exhibit a neutral pH. Topsoils are non-sodic and non-saline. Topsoils are characterised by balanced to low calcium levels, with organic matter content generally being moderate and ranging from low to high. The phosphorus and nitrate concentrations are low to moderate.

The subsoils range in thickness from 40 to 100 cm and exhibit a pH range from neutral to mildly alkaline. Sodicity varies from non-sodic to strongly sodic, whilst salinity is generally non-saline in the upper profile, rising to moderate-high in the lower B2 horizons. Subsoils are characterised by low calcium to magnesium ratios, with the organic matter content varying between extremely low to moderate. The phosphorus and nitrate concentrations are low to moderate.

4.3 Soil Erosive Potential and Soil Balances

4.3.1 Soil Erosive Potential

The soils with the highest erodibility are those with weak particle cohesion between soil particles and an abundance of soil particles that are easily detached and transported by raindrop impact and / or surface runoff (Hazelton & Murphy, 2025). These soils are particularly prone to erosion when their physical weaknesses are combined with low infiltration rates, leading to increased overland flow and concentrated water movement.

Soil erodibility is a function of inherent soil properties, not land management. However, disturbance and removal of protective vegetation or groundcover can expose highly erodible soils and rapidly accelerate erosion. Common indicators of high erodibility include:

- Low organic matter content.

- High exchangeable sodium percentage (ESP).
- Dispersive behaviour in the Emerson Aggregate Test (EAT).
- Poor soil structure.
- Fine or unstable surface textures (e.g. loamy sand, silty clay loam).

In the Project Area, soil dispersion class and erosive potential were assessed based on both site observations and laboratory analysis. The key parameters used included:

- Organic Matter (OM).
- EAT.
- ESP.
- Soil texture and structure.

According to Hazelton & Murphy (2025), dispersibility assessed through the Emerson Aggregate Test is a critical diagnostic tool. 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 with a rating of 1 being the most dispersive and 8 being non-dispersive.

The EAT results ranged between Class 3 and Class 4 (Hazelton and Murphy, 2025). Soils that scored Class 3 in the EAT are considered moderately dispersive, indicating that they are prone to slaking and breakdown upon wetting, increasing erosion risk through both surface crusting and rilling. The EAT scores for most subsoils ranged between 3 and 4, aligning with moderate dispersive potential, which supports the classification of these soils as moderately erodible. Soils with this classification are vulnerable to erosion where protective surface cover is absent, and they may require special management during disturbance or rehabilitation activities.

Based on the ESP results, the soils from the topsoil (A-horizon) were generally non-sodic, which indicates a low potential for dispersion, and the subsoils (B-horizon) were generally classified as sodic to highly sodic, which indicates a moderate to high potential for dispersion. Laboratory data from the detailed survey sites identified a mix of non-sodic (<6% ESP) and sodic (>6% ESP) subsoil horizons across the Project. Sodic soils tend to have weakly aggregated or massive structure, making them highly susceptible to dispersion, crusting, and tunnel erosion, especially under high-intensity rainfall events.

Based on the estimated organic matter laboratory results, the soils from the topsoil (A-horizon) were classified as low erodibility as the organic matter percentage ranged between 2-3 per cent. The subsoils (B-horizon) were classified as moderate erodibility as the estimated organic matter percentage ranged between <1 per cent to 2 per cent (Geeves *et. al.,*2007; Hazelton and Murphy, 2025).

While these classes offer a useful guide, they are preliminary in nature and may warrant further, more detailed erosion assessment and modelling to refine erosion risk predictions.

Caution should be exercised in using this assessment of soil erodibility, as soil erodibility is only one component of erosion hazard. Other contributing factors include rainfall erosivity, slope length and gradient, surface cover and land management practice. In addition to the soil erodibility class, the presence of erosive surface flows over the Project will increase soil erosion risk to be moderate to high. Effective control can be achieved through the implementation of structural measures, topsoiling and vegetative techniques and by phasing development. Appropriate erosion and sediment control measures are recommended for the Project and proposed OOPD.

The topsoil are generally suitable for stripping and reuse using standard ESC. The subsoil generally exhibits neutral pH, marginal to high sodicity and moderate salinity. Where 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.
- Slumping failure of batters.
- Soil dispersion leading to soil structure breakdown, increased run-off, and increased turbidity in run-off.

4.3.2 Soil Balances Summary

The soil survey, including soil logs, and laboratory results were used to determine depth of soil material suitable for recovery and reuse as material in rehabilitation. Based on the soil survey results, topsoil resources available from proposed Disturbance Footprint, including the OOPD, mine affected water dam, sediment water dam and haul roads (less handling loss) are summarised in **Table 4-3**.

Site preparation will include vegetation clearing and formalising of access tracks and haul roads. The OOPD footprint is proposed to disturb 282 ha.

The total Disturbance Footprint for the Project Area is estimated at 305 hectares, representing the area requiring rehabilitation or surface treatment. To support effective revegetation and soil stability, a topsoil cover depth of 0.15 m has been adopted. Based on this depth, the total volume of topsoil required is calculated to be approximately 457,122 m^3. The available topsoil volume is estimated at 824,476 m^3, which exceeds the project requirements. As a result, there is a calculated topsoil surplus of approximately 367,154 m^3, indicating that sufficient material is available to meet rehabilitation needs with additional capacity remaining, potentially for use in rehabilitation activities elsewhere on site.

Table 4-3 Available Soil Resource Summary for Project Area

Topsoil SMU	ASC Soil Type	Disturbance Footprint within Project Area (ha)	Topsoil Depth (m)	Volume (m^3)
1	Epipedal Black-Brown Vertosol	302	0.3	904,528
2	Palic Brown Arenosol	3	0.35	11,334
			Topsoil Volume Available	**915,862**
			Topsoil Less 10% Handling Loss	**824,276**

Table 4-4 Project Area Topsoil Balance

Description	Value
Total area for rehabilitation (ha)	305
Depth of topsoil cover (m)	0.15
Topsoil volume required (spread at 0.15 m) (m^3)	457,122
Topsoil volume available (m^3)	824,276
Topsoil Surplus (m^3)	367,154

5.0 Project Description and Post-Mining Land Use

The proposed OOPD is necessary to allow the development of the Pandora Pit in the southeast of ML1781 because of the space constraints within existing MLs. The OOPD will be developed in the southwest of the MLA area near the Pandora Pit, until sufficient capacity becomes available within Pandora Pit for in-pit dumping.

Site preparation will include vegetation clearing and formalising of access tracks and haul roads. The OOPD footprint is proposed to disturb 282 ha and will have a maximum height of 250 mADH. Overburden will be used for construction material.

5.1 Proposed Post Mining Landform

The OOPD will be designed with a maximum final slope angle of around 10% (≈6°) or flatter to ensure long-term erosion control. Construction of benches (10 - 20 m lift) to break slope length and manage run-off is proposed. The proposed final slopes for the landform is provided in **Figure 5-1 Appendix A**. The OOPD has been designed to achieve a factor of safety of ~1.3-1.5 to ensure permanent stability. The construction of the OOPD will be undertaken in accordance with relevant legislation, and site based procedures which include *WHC Mining Waste Management Plan* and the *WHC Coal Landform Design Guideline*.

Drainage and runoff will be managed through appropriately designed contour drains and drop structures. The final landform will be shaped to ensure long-term stability and compatibility with surrounding land uses.

Topsoil stockpile locations and volumes will vary throughout the life of the operation as the stockpiled topsoil is used on rehabilitation and new stockpiles are created as mining advances. The spatial location of stockpiles is recorded in a geographic information system (GIS) and a volume inventory is maintained.

Protective measures to ensure sufficient topsoil is available for rehabilitation and amelioration of long-term stockpiles/windrows will include standard terrace and chute channels and erosion protection fabrics and grassing of topsoil stockpiles. Development and management of topsoil stockpiles will be in accordance with the *WHC Topsoil Management Procedure*.

There will be no residual voids in the Project Area. The OOPD will remain a future elevated landform.

The final landform for the Project and the criteria and plan to achieve this final landform, has been proposed in the Progressive Rehabilitation and Closure Plan (PRCP) Schedule with an updated PRCP submitted as part of the Amendment Application. Proposed Post Mining Land Use

The soil and land resource impact assessment takes into consideration land suitability assessments, agricultural land class assessments, land capability assessments, and grazing suitability assessments.

The proposed Post Mining Land Uses (PMLUs) have been recommended based on the outcomes of the rehabilitation and closure studies supporting the PRCP (BMA, 2023). The PMLUs have been underpinned by rehabilitation objectives that focus on achieving a safe, stable, non-polluting and sustainable post-mining landscape (as defined in the EA). As per the PRCP the PMLUs proposed at DNM include cattle grazing, woodland habitat and watercourses. The Project Area PMLU is cattle grazing (see **Figure 5-2 Appendix A**) as set out in the PRCP Schedule.

6.0 Potential Impacts to Land Resources

To determine the impact of the project on the land and soil resource the following assessments were undertaken:

- Cropping land suitability assessment based on Regional Land Suitability Frameworks for Queensland (DNRM and DSITIA, 2013) and Guidelines for agricultural land evaluation in Queensland (Second Edition) (DSITI, 2015).
- Agricultural land class assessment based on Queensland Land Resources Assessment Guidelines, Volume 1: Soil and Land Resource Assessment (DES and DOR, 2021).
- Grazing suitability assessment based on Rehabilitated mined land suitability for beef cattle grazing in the Bowen Basin: Technical Paper 1 (Short, 2023).

6.1 Cropping Land Suitability

6.1.1 Methodology

The information required for the land suitability assessment was collected during the desktop assessment and verified on the ground during the field survey and laboratory testing program during 2021 and 2023. The land suitability classification was applied across the Project in accordance with the *Regional Land Suitability Frameworks for Queensland* (DSITIA & DNRM, 2013), particularly Section 10 Suitability Framework for the Inland Fitzroy and Southern Burdekin Area and the *Guidelines for Agricultural Land Evaluation in Queensland, 2nd Edition* (DSITIA & DNRM, 2015). This framework uses the biophysical features of the land and soil to derive detailed ratings tables for a range of land and soil hazards.

Not every limitation listed is relevant to each land evaluation study, geographical region or land use type. Limitations need not be incorporated into the land evaluation framework when:

- Particular land uses are not relevant to the study area (e.g. irrigation cropping where no suitable water supply is available or likely to be available).
- Diagnostic attributes that determine the limitation do not vary significantly at local or regional scales, such as frost within frost-free areas.
- Diagnostic attributes cannot be reliably correlated to the mapping units at the mapped scale.

The scheme consists of eight (8) limitations that classify the land based on severity against the suitability subclasses for various land management options. The eight (8) limitations associated with the biophysical features that are assessed by the framework (as per *Section 10 Suitability Framework for the Inland Fitzroy and Southern Burdekin Area*) (see **Appendix F**) are:

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

- Microrelief (Tm).
- Wetness (W).

Each hazard was assessed against set criteria tables, as described in the framework, 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 6-1**. These classes are said to define land in terms of suitability for a particular use which allows optimum, sustainable production with current technology, while minimising degradation to the land (Short, 2023).

Table 6-1 Land Suitability Class (after DoR, 2021)

Class	Suitability	Limitations	Description
1	Suitable	Negligible	Highly productive land requiring only simple management practices to maintain economic production.
2	Suitable	Minor	Limitations that either constrain production or require more than the simple management practices of Class 1 land to maintain economic production.
3	Suitable	Moderate	Limitations that either further constrain production or require more than those management practices of Class 2 land to maintain economic production.
4	Unsuitable	Severe	Currently unsuitable land. The limitations are so severe that the sustainable use of the land in the proposed manner is precluded. In some circumstances, the limitations may be surmountable with changes to knowledge economics or technology.
5	Unsuitable	Extreme	Land with extreme limitations that preclude any possibility of successfully sustained use of the land in the proposed manner.

The suitability framework provides the detail for assessing which cropping activities are suitable for individual mapped areas of land or soil. Unlike frameworks for several regions that prescribe land use requirements for beef cattle grazing and other land uses in addition to cropping, the framework relevant to the Bowen Basin (i.e. *Section 10 Suitability Framework for the Inland Fitzroy and Southern Burdekin Area)* does not (Short, 2023).

6.1.2 Results

6.1.2.1 Pre-Mining

Based on the work undertaken by SLR in 2021 and 2023, the land suitability assessment for the proposed Project has rated each of the SMU's within the Project Area (SMU 1) as Class 4 for cropping, with the main limitations being soil water availability (M), soil wetness (W) and surface condition (Ps) and Class 5 (SMU 2), with the main limitations being soil water availability (M). The results for the pre-mining Land Suitability Assessment is summarised in **Table 6-2** and shown in **Figure 6-1, Appendix A** and the detailed land suitability assessment is presented in **Appendix G.**

6.1.2.2 Post-Mining

Land suitability classes for areas not scheduled for the proposed mining activity disturbances are likely to remain the same. Land suitability classes for areas scheduled for the proposed mining activity disturbances should be managed and rehabilitated appropriately as per the

conditions set in the PRCP Schedule. These inputs should result in successful rehabilitation such that these areas return to an appropriate land suitability class.

Areas scheduled for the proposed mining activity disturbances will be managed and rehabilitated to meet the Rehabilitation Requirements as per the assigned PMLU. The PMLU areas to be rehabilitated to cattle grazing will likely retain the pre-mining land suitability classes except where rehabilitated slopes exceed 8% resulting in reduction of land suitability class from Class 4 to Class 5. A summary of the pre and post mining land suitability areas are provided in **Table 6-2**.

Table 6-2 Pre and Post Mining Cropping Land Suitability

Project Area	Land Suitability Class	Pre-mining		Post-mining		Difference
		ha	%	ha	%	ha
Project Area	4	413	83	271	54	-142
	5	87	17	229	46	142
Undisturbed and Disturbed Footprint within Project Area						
Undisturbed Footprint	4	112	22	195	39	83
	5	83	17	0	0	-83
Disturbance Footprint*	4	302	60	77	15	-225
	5	3	1	228	46	225
Project Area Total		**500**	**100**	**500**	**100**	

* Includes OOPD within ML1781, haul roads, Mine Affected Water Dam, Sediment Dam

6.2 Agricultural Land Class

6.2.1 Methodology

Three broad classes of agricultural land (Class A to Class C) and one non-agricultural land class (Class D) are identified in the Agricultural Land Class (ALC) system (DSITIA & DNRM, 2015) presented in **Table 6-3**.

The ALC may be derived by summarising land suitability information based on the number of crops that are suitable for any particular parcel of land. The derivation of ALC from suitability data is relatively straightforward where the land suitability framework is comprehensive, since it is a hierarchical classification. For each unique map area, the number of crop types for which the land is suitable – i.e. with a suitability class of 1, 2 or 3 – is calculated. The calculated results can be interpreted as follows:

- Class A crop land (crop land): Number of crop types equals to or more than 4. Crops with very similar agronomic requirements, which are managed in the same way, are not regarded as different crops (e.g. maize and grain sorghum, peaches and nectarines, oranges and lemons).
- Class B crop land (limited crop land): Three crops or less. Being categorised as limited crop land does not reduce the importance of these lands to agriculture. Instead, it simply states that these lands have the capacity to grow a more limited range of crops than class A land.
- Class C land (pasture land): Derived by an assessment of the pastoral potential of the various land types that are not suitable for cropping.

- Class D land (non-agricultural land): Presence of extreme land use limitations or other land use/data that suggests the land is permanently alienated from agriculture.

Table 6-3 Agricultural Land Classes

Class	Description
A	**Crop land** – Land that is suitable for a wide range of current and potential crops with nil to moderate limitations to production.
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 suitable for a narrow range of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops with changes to knowledge, economics or technology.
C	**Pasture land** – Land that is suitable only for improved or native pastures due to limitations that preclude continuous cultivation for crop production. 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 use, including land alienated from agricultural use.
A/C, A/D, B/C, C/D	Land that is a complex of class A, B, C or D land where it is not possible to delineate the land class at the map scale. The dominant class is the first code in the sequence and is assumed to be >50 per cent of the area, but <70 per cent.

6.2.2 Results

6.2.2.1 Pre-Mining

The ALC assessment of the soils in the Project Area has identified SMU1 as ALC C1, pastureland suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils. SMU2 has been identified as ALC C2, which is suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils. Results for the pre-mining Agricultural Land Assessment are summarised in **Tabe 6-4** and presented in **Figure 6-2, Appendix A.**

6.2.2.2 Post-Mining

Agricultural land classes for areas not scheduled for the proposed mining activity disturbances should remain the same. Agricultural land classes for areas scheduled for the proposed mining activity disturbances should be managed and rehabilitated appropriately as per the conditions set in the PRCP Schedule, according to the assigned PMLU. These inputs should result in successful rehabilitation such that these areas return to an appropriate agricultural land class. The PMLU areas to be rehabilitated to cattle grazing will likely retain the pre-mining ALC except where rehabilitated slopes exceed 8% resulting in reduction of ALC from C1 to C2 (see **Table 6-4**).

Table 6-4 Pre and Post Mining Agricultural Land Class

Project Area Activity	Land Suitability Class	Pre-mining		Post-mining		Difference
		ha	%	ha	%	ha
Project Area	C1	413	83	271	54	-142
	C2	87	17	229	46	142
Undisturbed and Disturbed Footprint within Project Area						
Undisturbed Footprint	C1	112	22	195	39	83
	C2	83	17	0	0	-83
Disturbance Footprint*	C1	302	60	77	15	-225
	C2	3	1	228	46	225

* Includes OOPD within ML1781, haul roads, Mine Affected Water Dam, Sediment Dam

6.3 Grazing Land Suitability

6.3.1 Methodology

As part of the rehabilitation requirements, a grazing suitability assessment is required. The land suitability classification was applied across the Project in accordance with "*Rehabilitated mined land suitability for beef cattle grazing in the Bowen Basin: Technical Paper 1* (Short, 2023). This was previously updated based on "*A rule-set for land suitability assessment of sustainable beef cattle grazing on land rehabilitated after open-cut mining in the Bowen Basin, Queensland (Short, 2018)",* of which the Guidelines for Agricultural Land Evaluation in Queensland, 2nd Edition *(*DSITI & DNRM, 2015*)* forms the basis.

There are certain land use requirements for beef cattle grazing. A list of land use requirements for crop and pasture growth, machinery use, land preparation, irrigation, and the prevention of land degradation has been defined for agricultural land uses in Queensland (DSITI & DNRM, 2015). Limitations are soil or land characteristics that impede agricultural production. These limitations are determined from soil and land diagnostic attributes and are usually expressed as land use requirements that are stated in the negative. Some limitations have universal application in land suitability frameworks (e.g. soil water availability) (DSITI & DNRM, 2015).

Eight land use requirements and eleven limitations were identified as important for beef cattle grazing PMLU rehabilitation (Short, 2023). This list is generally consistent with earlier government-led suitability frameworks for pasture development and cattle grazing in central Queensland. The 11 limitations and land-use associated with the biophysical features assessed by the framework are:

- Water availability (M) – adequate water storage in the soil profile to maintain plant growth.
- Nutrient supply – adequate nutrient supply (Nd) and soil pH is suitable for plant growth and does not cause nutrient toxicities or deficiencies (Nr).
- Soil physical factors, surface condition (P) – ease of seed germination and establishment.
- Salinity (S) – low level of soluble salts in the soil profile.
- Rockiness (R) – minimal impact from gravel, stone and rock at the soil surface.

- Topography – accessible slope gradients (Ts) and accessible surface micro-relief (Tm).
- Water erosion (Ea) – minimal soil loss and land degradation.
- Subsoil erosion (Eb) – minimal soil loss and land degradation.
- Potentially acid forming materials (D) – minimal environmental and agronomic impacts from low pH drainage.

The suitability framework provides the detail for assessing which cattle grazing activities are suitable and for what grazing system for individual mapped areas of land or soil. Each hazard was assessed against set criteria tables, as described in the framework, with each hazard ranked from 1 (most suitable) through to 5 (unsuitable) with the overall ranking of the land determined by its most significant limitation, as described in **Table 6-5.**

Table 6-5 Grazing systems and suitability classes for beef cattle grazing in the Bowen Basin (after Short, 2023)

Class	Suitability	Grazing System	Description
1	Suitable	Fattening/ finishing	Land capable of attaining maximum grazing productivity, i.e. production of young, finished, grass fed, export quality cattle in most seasons.
2	Suitable	Growing	Land on which younger cattle perform well but may be difficult to finish at a young age, depending on seasonal conditions.
3	Suitable	Breeding	Land able to carry breeding stock all year round depending on seasons.
4	Unsuitable	Sometimes	Land that is unsuitable most of the time but may be grazed in better seasons for short periods in conjunction with other country.
5	Unsuitable	Never	Land that is not suitable for cattle grazing.

6.3.2 Results

6.3.2.1 Pre-Mining

Prior to the commencement of mining activities, the Project Area formed part of the extensive grazing lands typical of the Bowen Basin. Historical land use comprised low-input pastoral systems supporting cow–calf operations and seasonal backgrounding, primarily on native pastures dominated by *Dichanthium, Bothriochloa*, and *Astrebla* species.

The information required for applying the Queensland land suitability classification for cattle grazing specifically to the assessment of open-cut coal mine rehabilitation in Queensland's Bowen Basin was collected during the desktop assessment and verified on the ground during the field survey and laboratory testing program. Data used to determine the land suitability classification is summarised in **Table 6-6** and presented in **Figure 6-3, Appendix A**. The complete laboratory results and chain of custody are shown in **Appendix C.**

The suitability framework criteria are shown in **Table 6-7** with the resulting class for each laboratory tested site assessed as part of the Project. The dominant limiting criteria in the pre-mining SMU1 and SMU2 was nutrient deficiency and soil water storage, with SMU1 rated as Class 5 and SMU2 as Class 4 based on the soil water storage criterion. All other plant production, land surface and degradation factors had parameters within Class 1 and

Class 2. Results for the pre-mining Grazing Land Suitability Assessment are presented in **Figure 6-3**, **Appendix A**.

Table 6-6 Parameters Used to Determine Pre-mining Grazing Suitability Class

SMU	Observation Site	pH in 0-0.1m	Exchangeable Sodium Percentage in 0-0.1m soil depth	Saturated Electrical Conductivity in the Effective Rooting Depth (ERD)	Exchangeable Sodium Percentage at 0.5m depth	Available Phosphorus (Colwell-P)	Gravel Percentage	Calculated Plant Available Water	Surface Condition	Slope	Microrelief Vertical Interval
			%	dS/m	%	mg/kg	%	mm	-	%	m
1	HA01	6.9	1.9	2.8	10.7	1.5	1.1	120.0	Cracking	4	0
	HA02	7.2	2.0	3.5	11.9	2.6	2.1	120.0	Cracking	4	0
	HA03	6.7	1.4	2.7	9.1	4.7	2.9	116.0	Loose	4	0
2	HA13	6.8	0.2	2.0	1.1	13.3	0.0	36.0	Loose	4	0

Table 6-7 Pre-mining Grazing Suitability Class Based on SMU 1 and SMU 2 Chemical and Physical Properties

Limitation	Indicator	Suitable			Unsuitable		Grazing Suitability Class			
							SMU 1			SMU 2
		Class 1	Class 2	Class 3	Class 4	Class 5	H01	H02	H03	H13
Water availability (M)	Soil water storage (mm)	>75	75-60	<60-40	<40-30	<30	1	1	1	4
Nutrient deficiency (Nd)	Available-P (mg/kg) in 0-0.1 m depth increment	>20	20-14	<14-8	<8-4	<4	5	5	4	3
Nutrient availability and toxicity (Nr)	pH in 0-0.1 m depth increment	7.3-6.6	<6.6-6.0 >7.3-7.9	<6.0-5.6 >7.9-8.4	<5.6-5.0 >8.4-9.0	<5.0 >9.0	1	1	1	1
Surface condition (P)	Surface condition	Fine	Coarse	Surface crust	Very hard setting	Massive	1	1	1	1
Salinity (S)	ECe (dS/m) in ERD (0-0.6 m depth increment)	<2	2-4	>4-10	>10-16	>16	2	2	2	2
Rockiness (R)	Gravel, 20 – 60 mm (%) Cobble, 60 – 200 mm (%) Stone, 200 – 600 mm (%) Boulders, >600 mm (%)	<20 <10 <2 0	20-50 10-20 2-10 <2	>50-70 >20-50 >10-20 2-10	>70-85 >50-75 >20-50 >10-20	>85 >75 >50 >20	1	1	1	1
Slope (Ts)	Slope grade (%)	<5	5-10	>10-15	>15-20	>20	1	1	1	1
Microrelief (Tm)	Vertical interval (m)	0	<0.2	0.2-0.4	>0.4-0.6	>0.6	1	1	1	1
Water erosion (Ea)	Slope (%), ESP <6 (%) in 0-0.1 m depth Slope (%), ESP >6-14 (%) in 0-0.1 m depth Slope (%), ESP >14 (%) in 0-0.1 m depth	<5 <3 <1	5-8 3-6 1-2	>8-12 >6-10 >2-4	>12-18 >10-12 >4-6	>18 >12 >6	1	1	1	1
Subsoil erosion (Eb)	ESP (%) at 0.5 m depth	<6	6-14	>14-23	>23-34	>34	2	2	2	1
PAF materials (D)	Strongly acid conditions (pH <4.5) within (x) m depth	>3	3-2	<2-0.9	<0.9-0.6	<0.6	1	1	1	1
Grazing Suitability Class							**5**	**5**	**4**	**4**

6.3.2.2 Post-Mining

Grazing suitability for areas not scheduled for the proposed mining activity disturbances should remain the same. Areas scheduled for the proposed mining activity disturbances will be managed and rehabilitated to meet the cattle grazing Rehabilitation Requirements. Increased slopes in the final landform will reduce the grazing suitability as it results in an increase in the water erosion limitation (Ea). The OOPD will be designed to a maximum final slope angle of around 10% (≈6°) or flatter to ensure long-term erosion control which would not decrease the land suitability based on the criteria presented in **Table 6-7**. Based on a slope assessment undertaken for the Project Area post mining landform, slopes associated with the proposed Disturbance Footprint will not exceed 10%. Therefore, water erosion which is dependent on the soil sodicity and slope is not the main limitation for post mining grazing suitability. e (see **Table 6-8**).

The predominant limitation to grazing suitability that will remain post mining is nutrient deficiency. Approximately 98% (**Table 4-3**) of the topsoil available to stockpile and reuse as growth medium have available-P concentrations associated with grazing suitability Class 5 (<4 mg/kg available-P). Based on the available information the post mining grazing land suitability has been assessed as Class 4 and Class 5 (**Figure 6-4, Appendix A**).

Soil nutrient deficiency is already recognised as a major constraint to pasture and cattle production in central Queensland (Shields and Williams 1991) and across northern Australia more broadly (Dixon, et al. 2020). Short (2025) indicates that nutrient deficiency does not preclude land to be rehabilitated to a suitable grazing land suitability (Class 3 or better). Where an evaluation decides an area of rehabilitation is Class 4 (Available-P <8-4mg/kg) or Class 5 (available-P <4 mg/kg) this could be adjusted by fertiliser application to make the rehabilitation suitable (i.e. Class 3 (available-P >14-8 mg/kg) or better) providing no other severe or extreme limitations are present which is the case for the soils evaluated in the Project Area.

Post mining Grazing Land Suitability values (**Table 6-8** and **Figure 6-4, Appendix A**) are based on the inherent soil properties without the application of ameliorants to enhance soil productivity. The application of ameliorants is further described in the PRCP.

Table 6-8 Pre and Post Mining Grazing Land Suitability

Project Area Activity	Land Suitability Class	Pre-mining		Post-mining		Difference
		ha	%	ha	%	ha
Project Area	4	413	83	413	83	0
	5	87	17	87	17	0
Undisturbed and Disturbed Footprint within Project Area						
Undisturbed Footprint	4	84	17	84	17	0
	5	112	22	112	22	0
Disturbance Footprint*	4	3	1	0	0	-3
	5	302	60	305	61	3

* Includes OOPD within ML1781, haul roads, Mine Affected Water Dam, Sediment Dam

7.0 Mitigation and Management Measures

7.1 Rehabilitation

The DNM (EPML00561913) Progressive Rehabilitation and Closure Plan (PRCP) was first submitted in July 2023 under the previous owners mine plan, and established the baseline domains, proposed PMLUs, and Non-Use Management Areas (NUMAs) for the DNM. Whitehaven Daunia has submitted an updated transitional PRCP to align with the updated Life of Mine (LoM) Plan. A subsequent PRCP amendment application for the Project has been submitted following the approval of PRCP Schedule by DETSI, which will specifically incorporate the OOPD, into the rehabilitation domains.

Given this timing, the existing EA amendment demonstrates that the OOPD can be returned to a safe, stable, non-polluting final landform and rehabilitated to a suitable PMLU. The detailed landform design criteria, milestones and completion requirements for the OOPD will be confirmed through the future PRCP amendment application.

7.2 Rehabilitation Methodology

Rehabilitation of the Project Area will be in accordance with the DNM rehabilitation commitments as per the amended PRCP and DNM EA.

7.2.1 Soil and Material Balances

Soils for rehabilitation will be salvaged and made available for reuse in establishing a soil profile on the post-mining landform. Volume calculations and soil balance will be determined to inform post-mining requirements for soil depths. The estimated volume of suitable soil throughout the Project Area is summarised in **Section 4.3.2**.

7.2.2 Soil Sourcing and Substitution

Suitable topsoil will be stripped for use in later rehabilitation. The topsoil will either be stockpiled until suitable re-contoured areas are available or directly returned across areas to be rehabilitated. The results of the land resources assessment identified that the topsoil resources are adequate for the rehabilitation of the disturbed areas.

Where practicable, soil will not be stripped in either an excessively dry or wet condition to prevent pulverisation of the natural soil aggregates or damage of the resource through compaction by equipment. In addition, subsoils will be assessed in line with topsoil criteria to ascertain their use in rehabilitation. Where subsoils meet topsoil criteria, they are also planned to be appropriately stockpiled.

To reduce soil degradation during stripping operations preference will be given to using equipment which can grade or push soil into windrows such as graders or dozers for later collection by conventional truck and shovel techniques. This will minimise compaction impacts of heavy equipment that is often necessary for economical transport of soil material. These techniques are examples of preferential, less aggressive soil handling systems which may be adopted.

7.2.3 Soil Placement and Management

All soils removed will be placed in designated stockpile areas or returned to areas available for immediate rehabilitation. Freshly stripped and placed topsoil retains seed, micro-organisms and nutrients than stockpiled soil and vegetation establishment is generally improved by the direct return of topsoil and is considered ‘best practice’ topsoil management. Where long term storage stockpiles be proposed, accurate records are required indicating stockpile volumes and locations.

Topsoil must be strategically stripped ahead of mining in accordance with the WHC Topsoil Management Procedure. A topsoil inventory, which identifies the topsoil requirements for rehabilitation and availability of suitable topsoil on site, is to be provided with any Estimated Rehabilitation Cost (ERC) application. Progressive rehabilitation for all areas must commence within two (2) years of when areas become available within the mining leases.

The following management and mitigation strategies is to be implemented to reduce degradation of topsoil during stockpiling operations.

- Locations of stockpiles will be recorded using GPS along with data relating to the soil type and volume. An inventory of available soil is maintained and updated regularly to ensure adequate topsoil will be available for planned rehabilitation activities.
- The surface of soil stockpiles will be left in as coarsely structured condition where practicable to promote rainfall infiltration and minimise erosion prior to cover vegetation becoming established.
- Storage time will be minimised, where possible. If long term stockpiling is planned, stockpiles should be seeded with an annual cover crop.
- Growth media including topsoil will be spread to depths according to target requirements.
- Where possible, suitable growth media will be re-spread directly onto rehabilitation areas. Growth media will be treated with fertiliser and seeded in one consecutive operation, reducing the potential for compaction and topsoil loss to wind and water erosion.

Stockpiles are not disturbed until required for rehabilitation, weed management, erosion control or for seeding and fertilising purposes. Ameliorants are applied post-spreading of soil resources on rehabilitation areas.

7.2.4 Vegetation Establishment

7.2.4.1 Timing

Revegetation operations will consider both the season and timing of potential germination during the drier months. The preferred seeding time for grazing species establishment is expected to be in September/early October or April/May when there is sufficient soil moisture in the profile.

7.2.4.2 Revegetation

Revegetation methods for all types of disturbed land within the Project will normally consist of the following:

- Respreading of freshly stripped or stockpiled topsoil.
- Contour ripping.
- Application of appropriate fertiliser and ameliorants for plant establishment, after soil chemical analysis, if required.
- Seeding with the appropriate seed mix. The provenance (where the seed comes from) is considered important for all species. Seeds will be sourced as locally as possible from natural populations. Although the local provenance boundary locations may differ between species, seed should ideally be obtained from the Brigalow Belt North bioregion.
- Proof of provenance will be sought from the seed supplier(s) along with germination and viability certificates for all purchased seeds.

- The growth media for cattle grazing will be pre-stripped topsoil, spread over rehabilitated landforms at a depth ≥150mm, and ameliorated if recommended by an appropriately qualified person (AQP).
- The recommended revegetation species mix for cattle grazing PMLU is based on seeding preferred pasture species and legumes cognisant of grazing best management practice.
- Contour ripping is to be used as an erosion control measure immediately after surface preparation and immediately prior to revegetation.

7.2.5 Erosion and Sediment Control

The principal objectives of erosion and sediment control for rehabilitation areas are to:

- Minimise erosion and sedimentation from all active and rehabilitated areas, thereby minimising sediment ingress into surrounding surface waters.
- Segregate contact water (surface run-off from disturbed catchments e.g., active areas of disturbance, stockpiles and rehabilitated areas until stabilised) from clean water (surface run-off from catchments that are undisturbed or relatively undisturbed by Project-related activities and rehabilitated catchments) and maximise the retention time of contact water so that any discharge from the disturbance area is in line with the EA.
- Avoid the potential for runoff and incorporate suitable erosion and sediment control measures.
- Manage surface flows upstream of any surface disturbance during Project works so that rehabilitation activities are not affected by excessive run-on water.
- Establish sustainable long-term surface water management features following rehabilitation of the site, including implementation of an effective revegetation and maintenance program.
- Monitor the effectiveness of erosion and sediment controls and maintain in line with an ESC Plan.
- Land disturbance will be restricted to that necessary for the Project.
- Disturbance will be controlled using the Permit to Disturb process and in accordance with the EA.
- All available topsoil will be salvaged for use in rehabilitation, where practicable.
- Erosion from topsoil stockpiles will be managed which requires stockpile sites to be located outside the limits of drainage lines, with controls to prevent mobilising stockpiled material and capture sediment as per an approved ESC Plan.
- Topsoil stockpiles will be managed (in accordance with a Topsoil Management Plan as per EA).
- Stormwater and runoff from catchments directly upstream of the Project will be diverted away from the site during Project works.
- Vehicles to utilise maintained tracks and roads.

Table 7-1 summarises the risks associated with surface disturbance and the associated erosion and sediment control measures which can be applied.

Table 7-1 Erosion Causes and Control – Soil Disturbance Activities

Area	Control Measure
Cleared Land	Restrict clearing to areas essential for the Project works. Windrow vegetation debris along the contour. Minimise length of time soil is exposed. Divert run-off from undisturbed areas away from the Project works. Direct run-off from cleared areas to be dealt with.
Rehabilitation	Install drainage control works. Spread topsoil or appropriate growth media, rip on the contour and seed with appropriate seed mix.
Infrastructure	Vehicles to utilise maintained tracks and roads. Sediment will be controlled as part of an ESC Plan. Rehabilitate disturbed areas around work sites as soon as practicable after becoming available.

7.3 Land Resource Mitigation Measures

Potential impacts to land resources and rehabilitation have been considered, and included the following:

- Impacts to land due to disturbance from mining activities (and changes to land use).
- Soil loss due to wind or water erosion.
- Reduction in soil quality and fertility including nutrient loss.
- Inability to achieve post-mine land uses.
- Contamination of land due to leaks or spills from plant, storage facilities or infrastructure and/or transport of contaminated soil or water and introduction into previously uncontaminated areas.

The following general mitigation strategies are to be implemented by the Project to minimise the extent and severity of land disturbance and constraints on rehabilitation, thus mitigating risks that could result in environmental impacts:

- Clearing will occur within the area approved via the Permit to Disturb process.
- Appropriate storage and management of hydrocarbons and hazardous materials within the Project Area to prevent contamination of land e.g., bunding.
- Disturbance to be undertaken in consideration of water flows that could affect land resources during early mining activities.
- Amelioration to be applied as per PRCP to improve phosphorus availability and support long-term soil fertility.
- Topsoil will be stripped prior to mining and direct re-spread is the preferred method to minimise topsoil handling and reduce damage to soil structure and propagules (as per WHC Topsoil Management Plan as per DNM EA).
- Topsoil that is not directly re-spread will be stockpiled for re-use in rehabilitation.
- Appropriate surface water management measures are to be implemented including clean water diversions, and use of in-pit sumps and sediment dams to capture mine affected runoff and stormwater as outlined in an approved Water Management Plan.
- Establishment of engineered waste dumps, levees, and other landforms with appropriate non-dispersive materials design and features for erosion protection and location for optimal effectiveness, land suitability and efficiency.

- Monitoring and maintenance of rehabilitation until post-mining land use criteria and relinquishment have been achieved.

8.0 Conclusion

With appropriate management and rehabilitation measures, the proposed Project can be developed without significant long-term degradation of land and soil resources. The Project Area is constrained for cropping suitability and grazing pre-mining.

Key risks relate to sodic and dispersive subsoils, nutrient deficiency, erosion susceptibility, and soil structural decline if resources are not carefully managed. The proposed mitigation measures, including effective soil stripping, stockpiling, placement, and erosion controls, will ensure that soil resources are conserved and that land is progressively rehabilitated to a sustainable post-mining state.

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WHC Topsoil Management Procedure

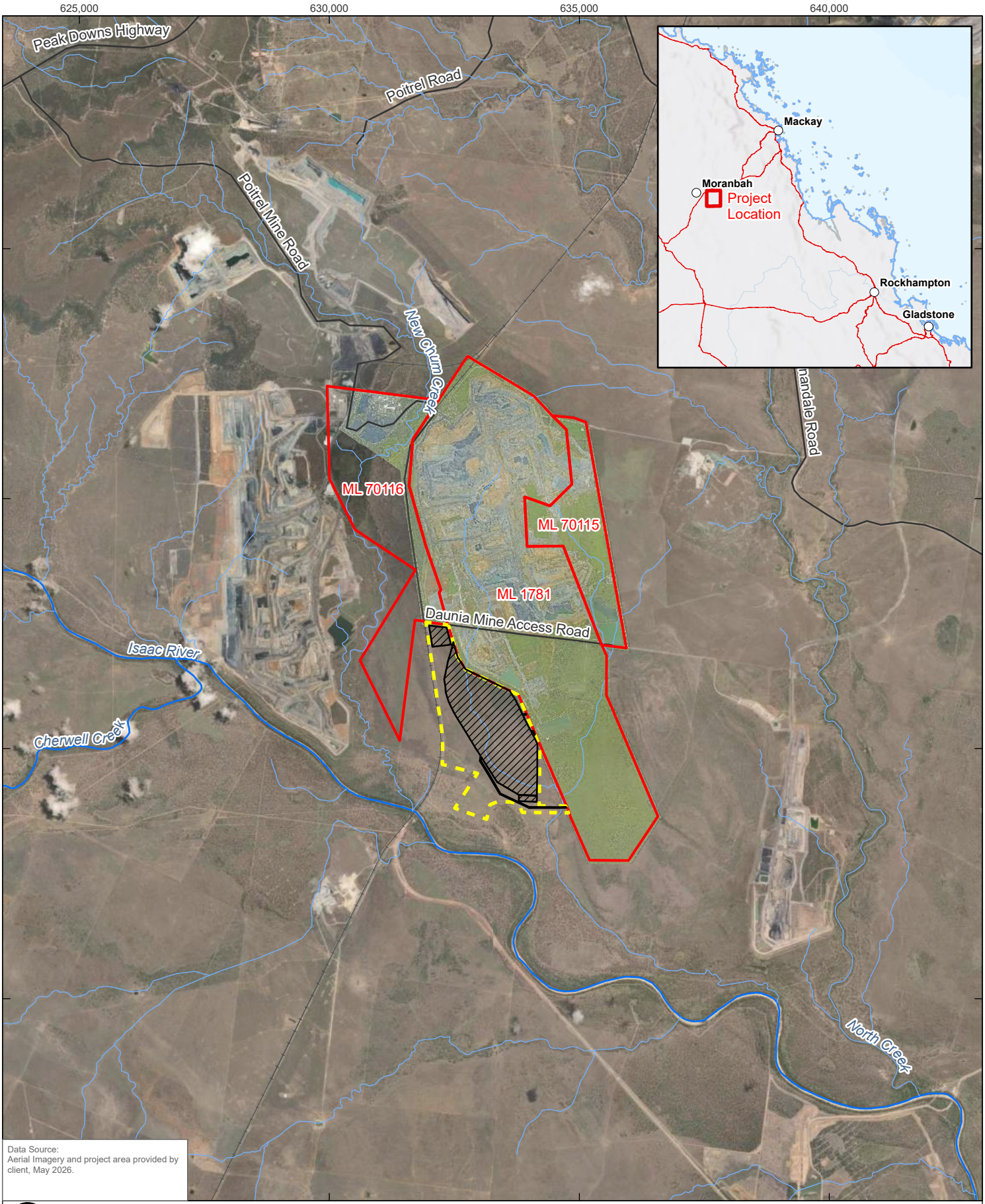
Appendix A Figures

Soil and Land Resource Assessment Report

Whitehaven Daunia Pty Ltd

SLR Project No.: 620.042120.00001

24 May 2026



Data Source:
Aerial Imagery and project area provided by client, May 2026.

0 1 2 km

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:100,000 at A4
Project Number:	620.042120.00001
Date Drawn:	14-May-2026
Drawn by:	RB

LEGEND

- Road
- Railway
- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Disturbance Footprint

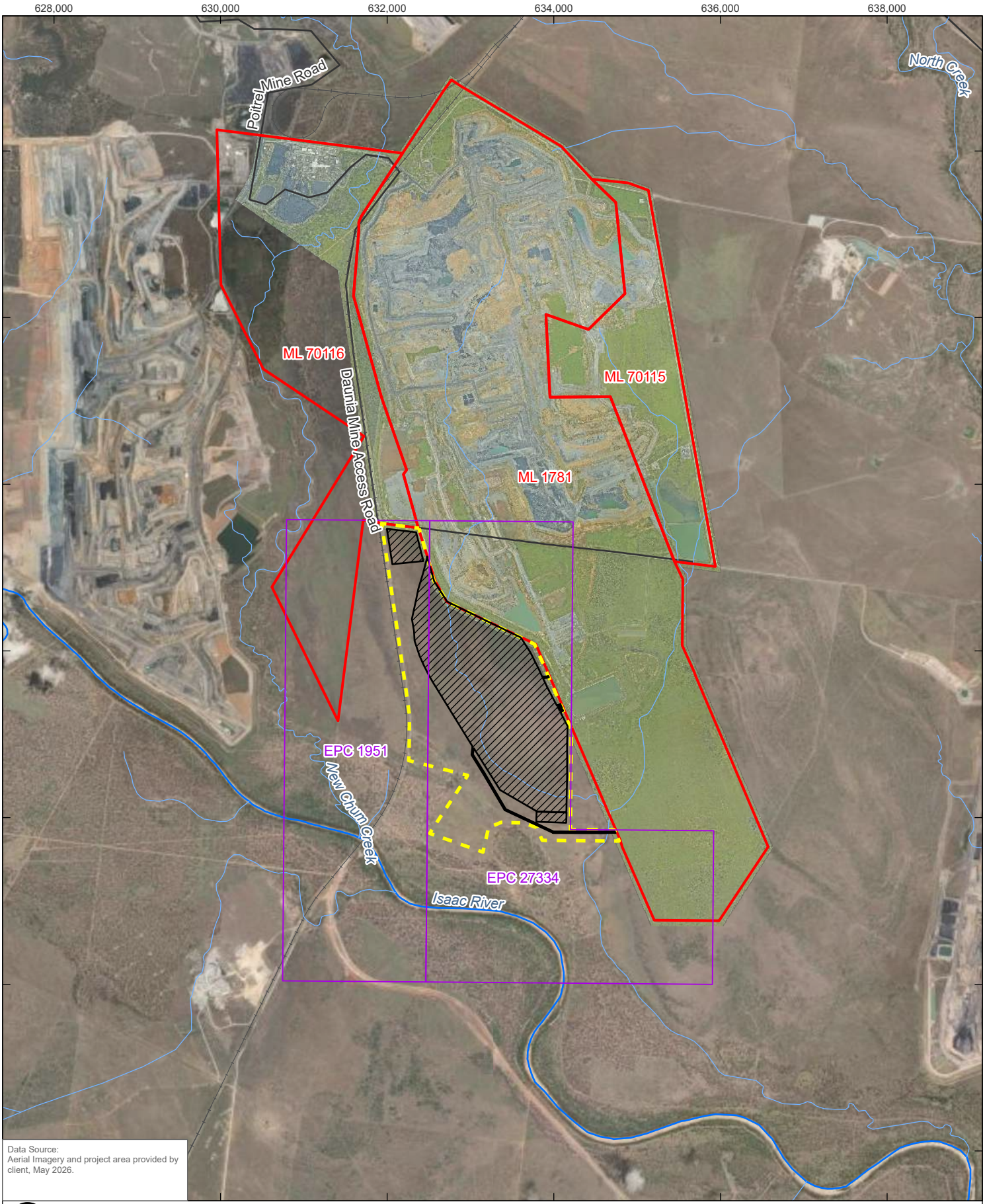
DAUNIA WEST INFRASTRUCTURE PROJECT

SITE LOCATION

SLR

FIGURE 1-1

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\09 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_PD_F01-01_DWIP_Site Location



Data Source:
Aerial Imagery and project area provided by client, May 2026.

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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.042120.00001
Date Drawn:	14-May-2026
Drawn by:	RB

LEGEND

- Road
- Railway
- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Disturbance Footprint
- Exploration Permit for Coal

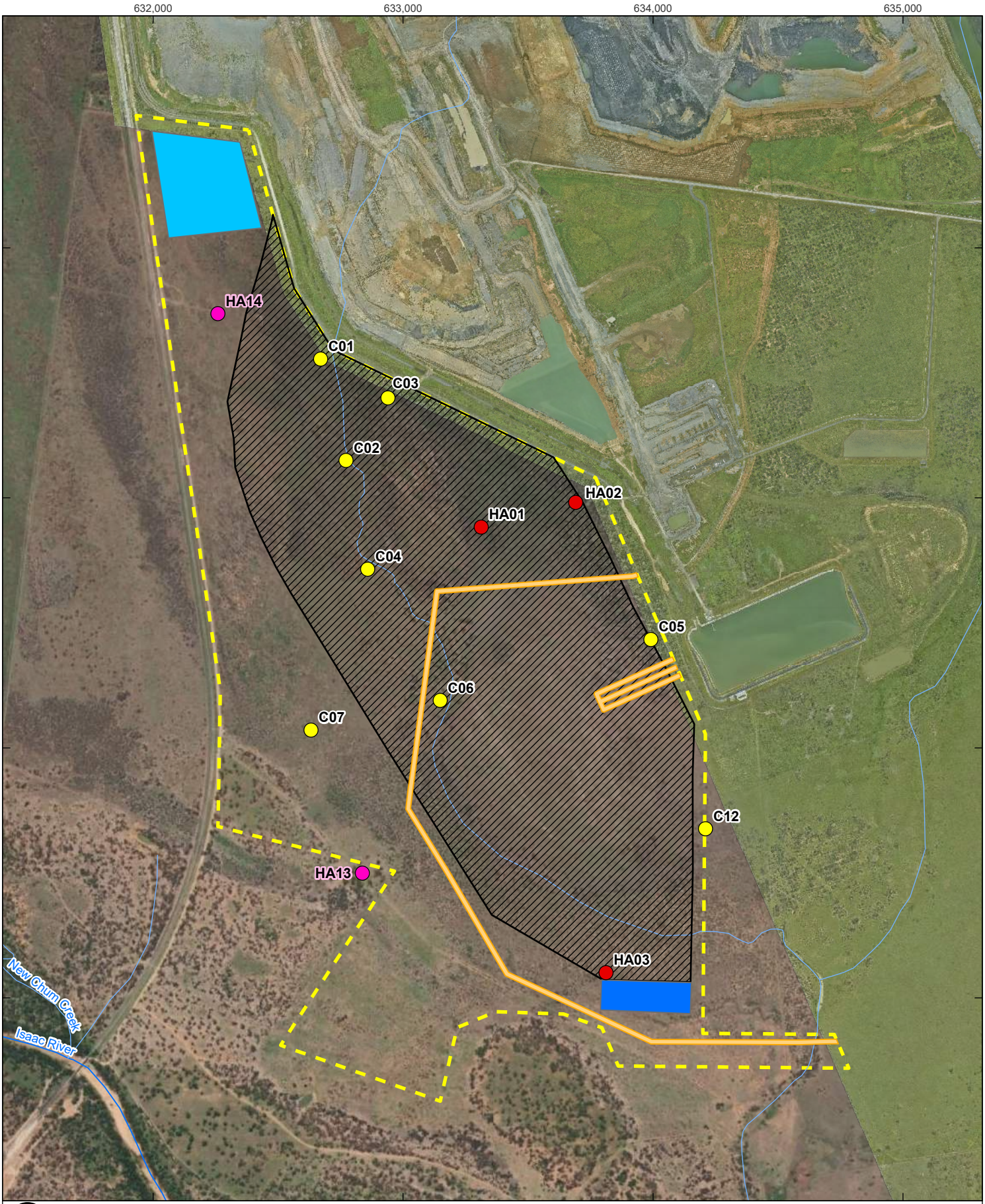
DAUNIA WEST INFRASTRUCTURE PROJECT

PROJECT OVERVIEW

SLR

FIGURE 1-3

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\09 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_PD_F01-03_DWIP_Project Overview



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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	28-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Soil Survey Locations (June 2021)

- Check Site
- Hand Auger

Soil Survey Locations (October 2023)

- Hand Auger

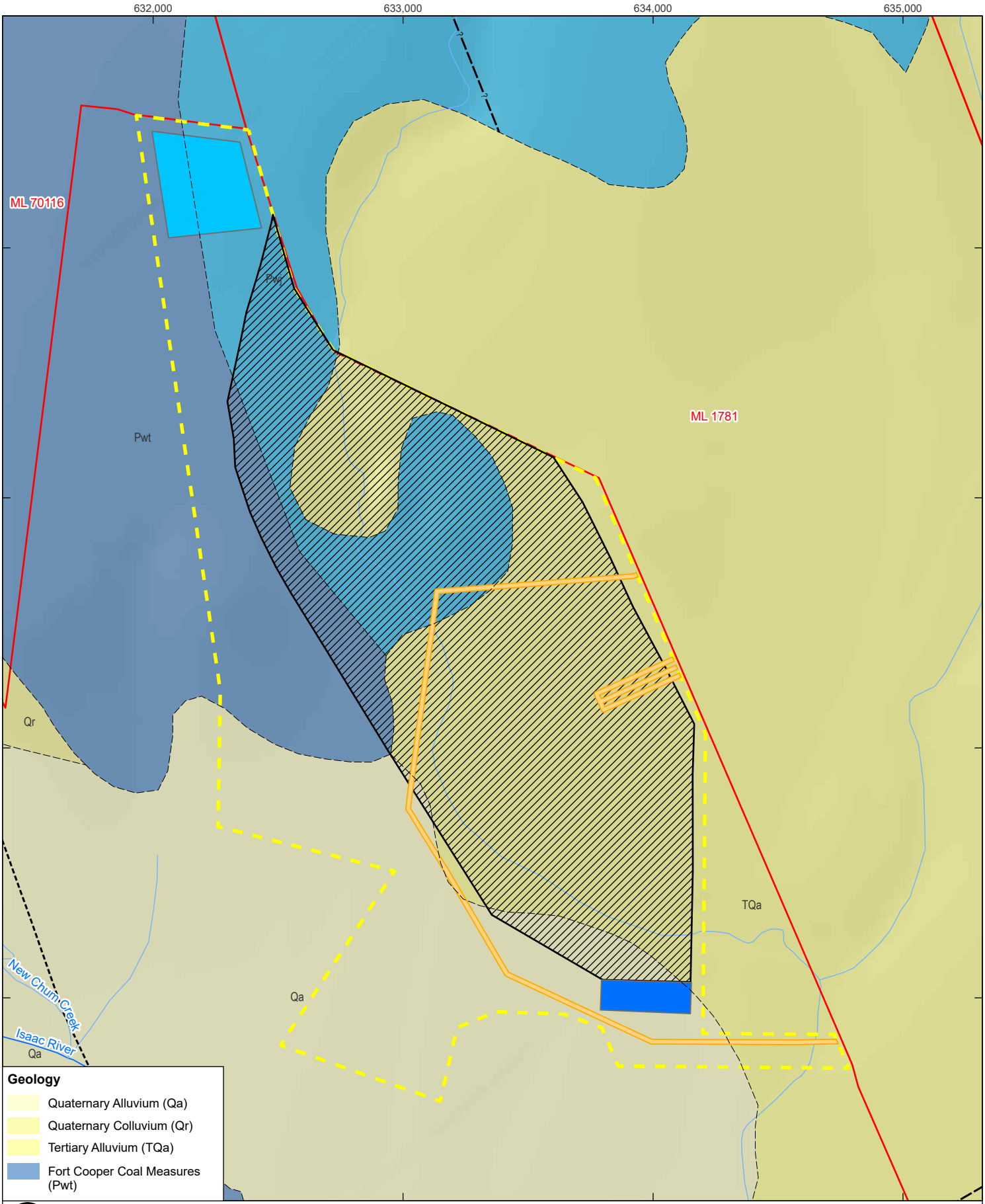
DAUNIA WEST INFRASTRUCTURE PROJECT

SITE SAMPLING PLAN

SLR

FIGURE 2-1

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F02-01_Site Sampling Plan



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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	28-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road
- Fault approximate
- Fault concealed
- Fault inferred
- Geological boundary approximate

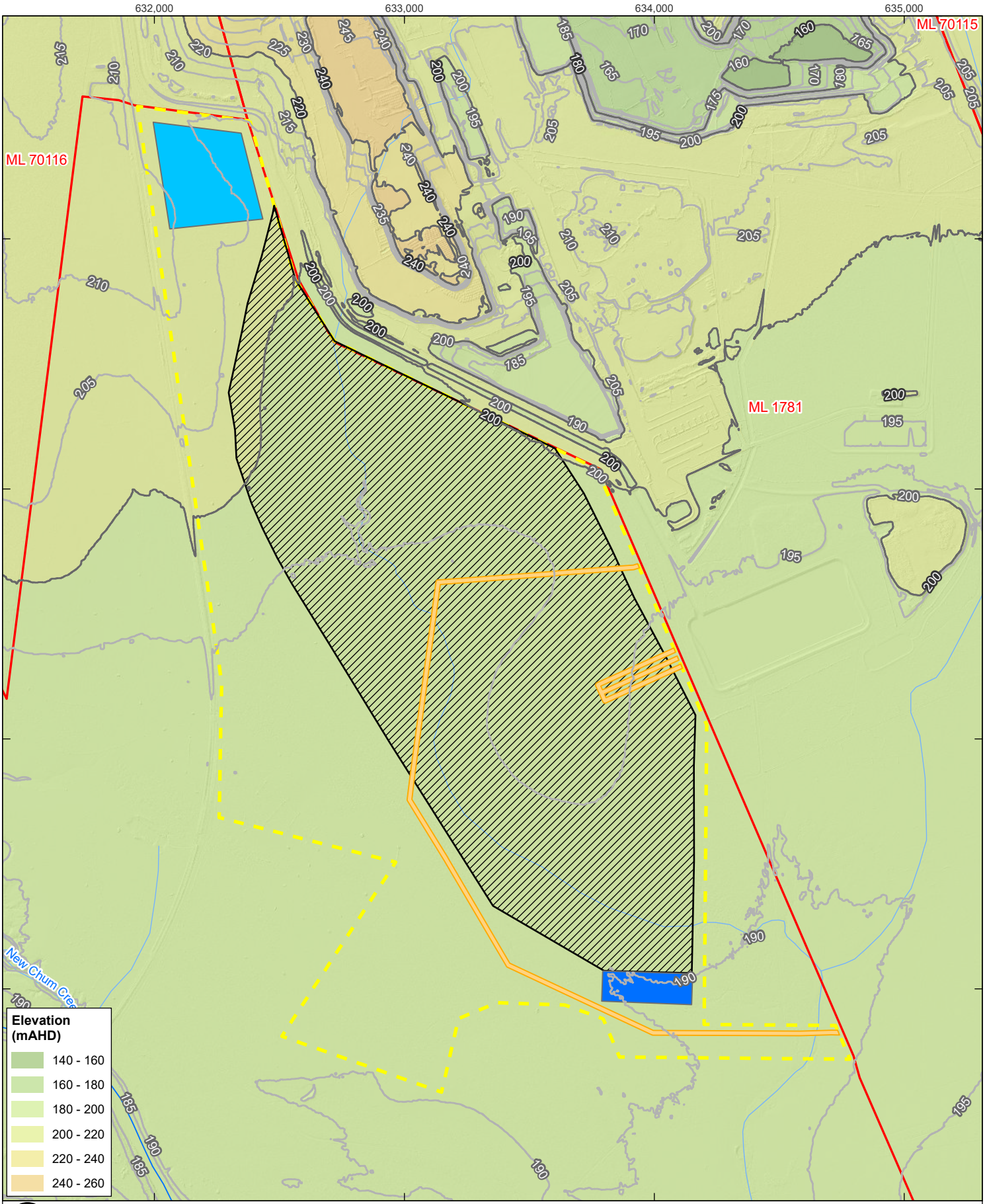
DAUNIA WEST INFRASTRUCTURE PROJECT

SURFACE GEOLOGY

SLR

FIGURE 3-2

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F03-02_DWIP_Surface Geology



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	28-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Major Topographic Contour (20mAHD)
- Minor Topographic Contour (5mAHD)
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

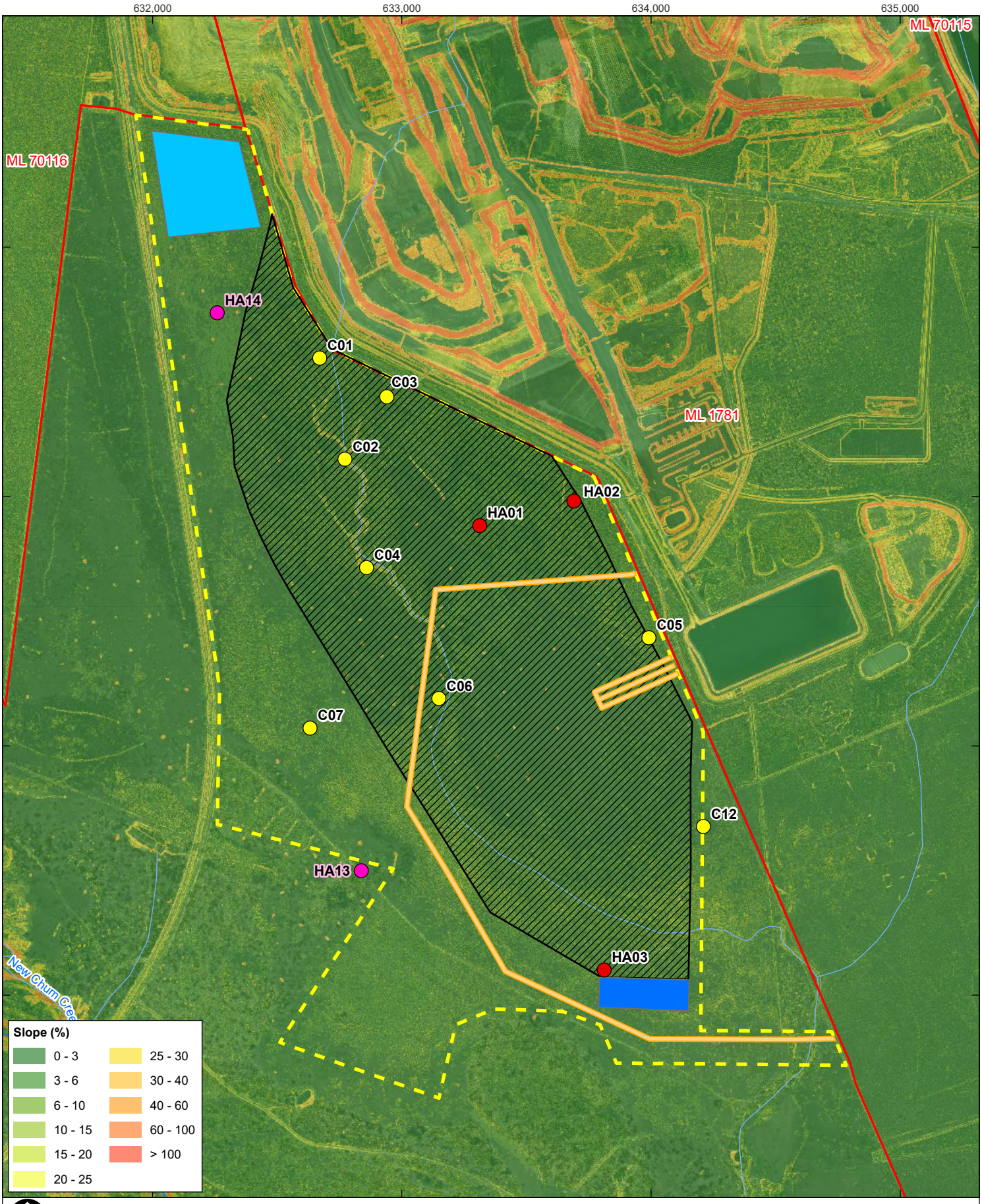
DAUNIA WEST INFRASTRUCTURE PROJECT

TOPOGRAPHY AND HYDROLOGY

SLR

FIGURE 3-3

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F03-03_DWIP_Topography and Hydrology



LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Excluded Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Soil Survey Location (June 2021)

- Check Site
- Hand Auger

Soil Survey Location (October 2023)

- Hand Auger

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

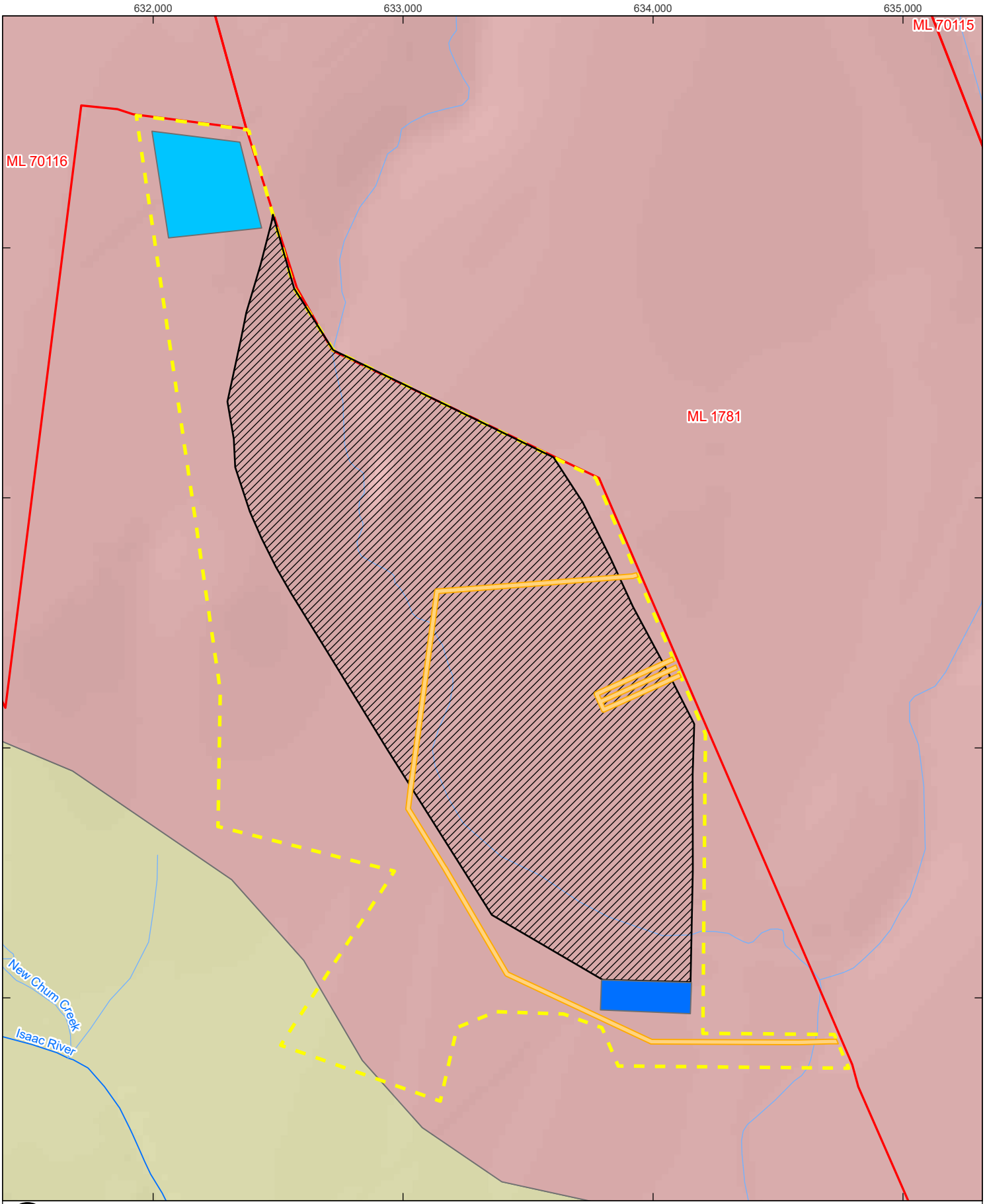
DAUNIA WEST INFRASTRUCTURE PROJECT

SLOPE ANALYSIS

SLR

FIGURE 3-4

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F03-04_DWIP_Slope Analysis



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Vegetation

- Savannah woodland with eastern mid-height grasses
- Scrub, or mixed shrub woodland

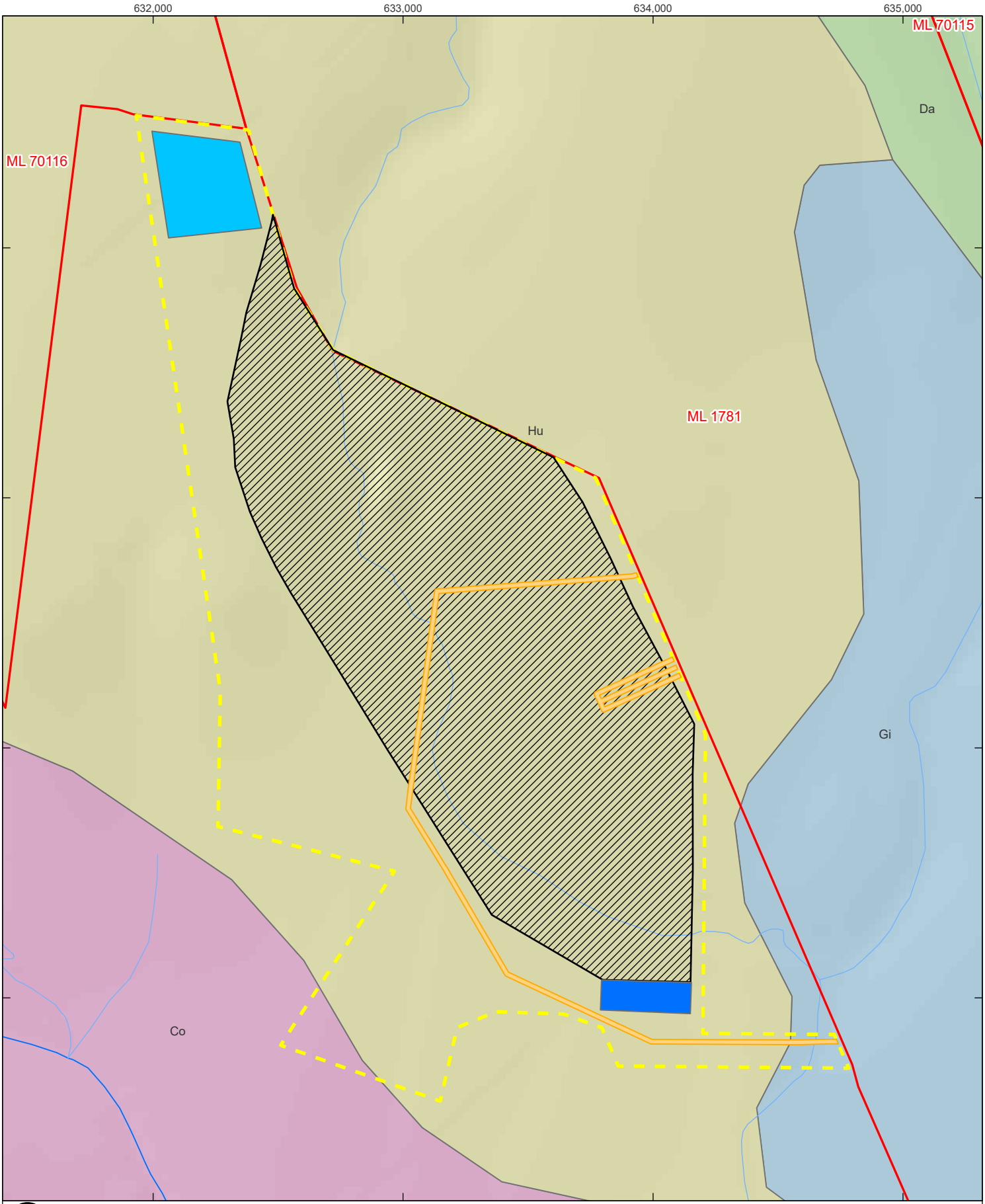
DAUNIA WEST INFRASTRUCTURE PROJECT

VEGETATION

SLR

FIGURE 3-5

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F03-05_DWIP_Vegetation



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Land Systems

- Connors
- Daunia
- Girrah
- Humboldt

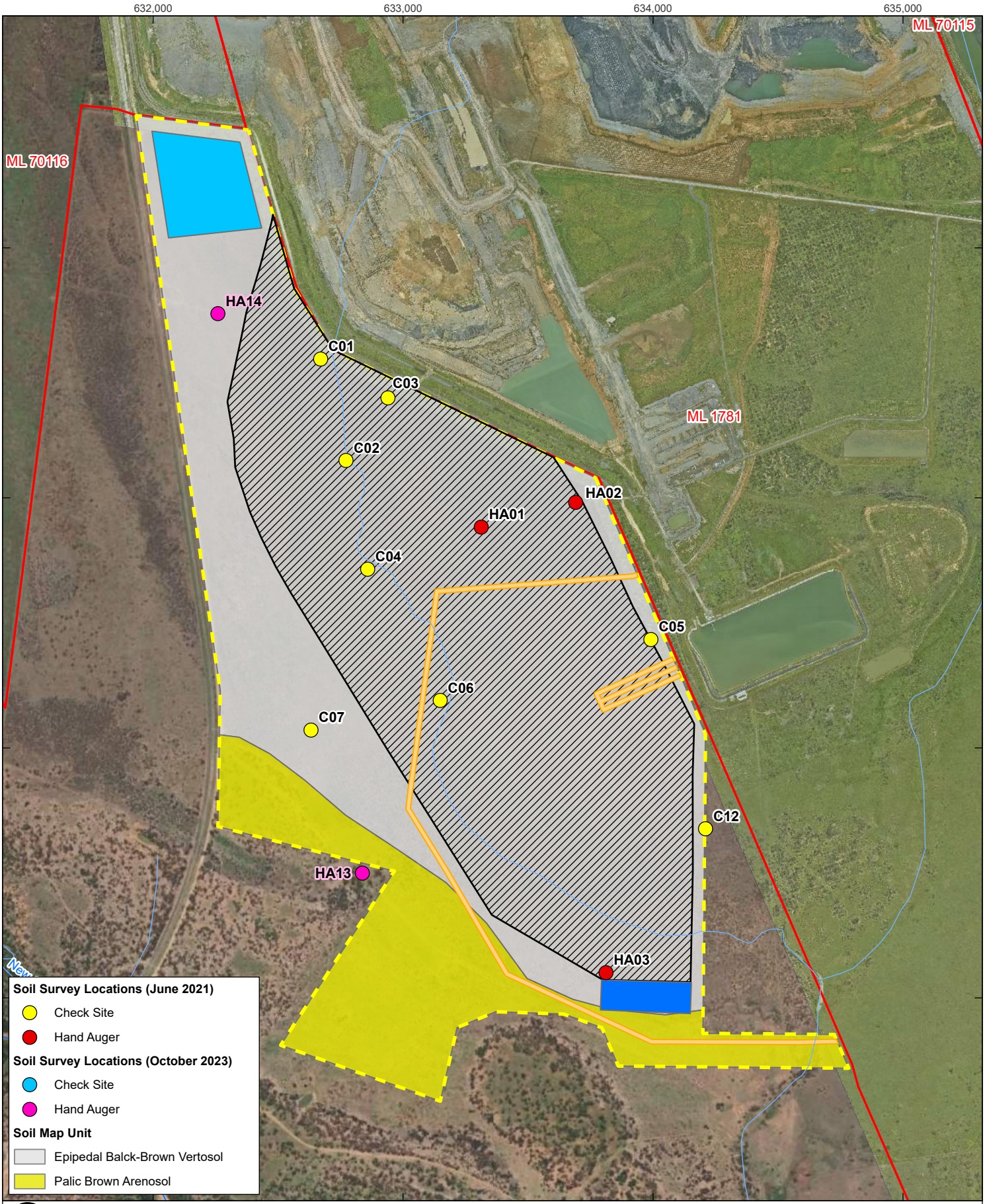
DAUNIA WEST INFRASTRUCTURE PROJECT

LAND SYSTEMS

SLR

FIGURE 3-6

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F03-06_DWIP_Land Systems



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

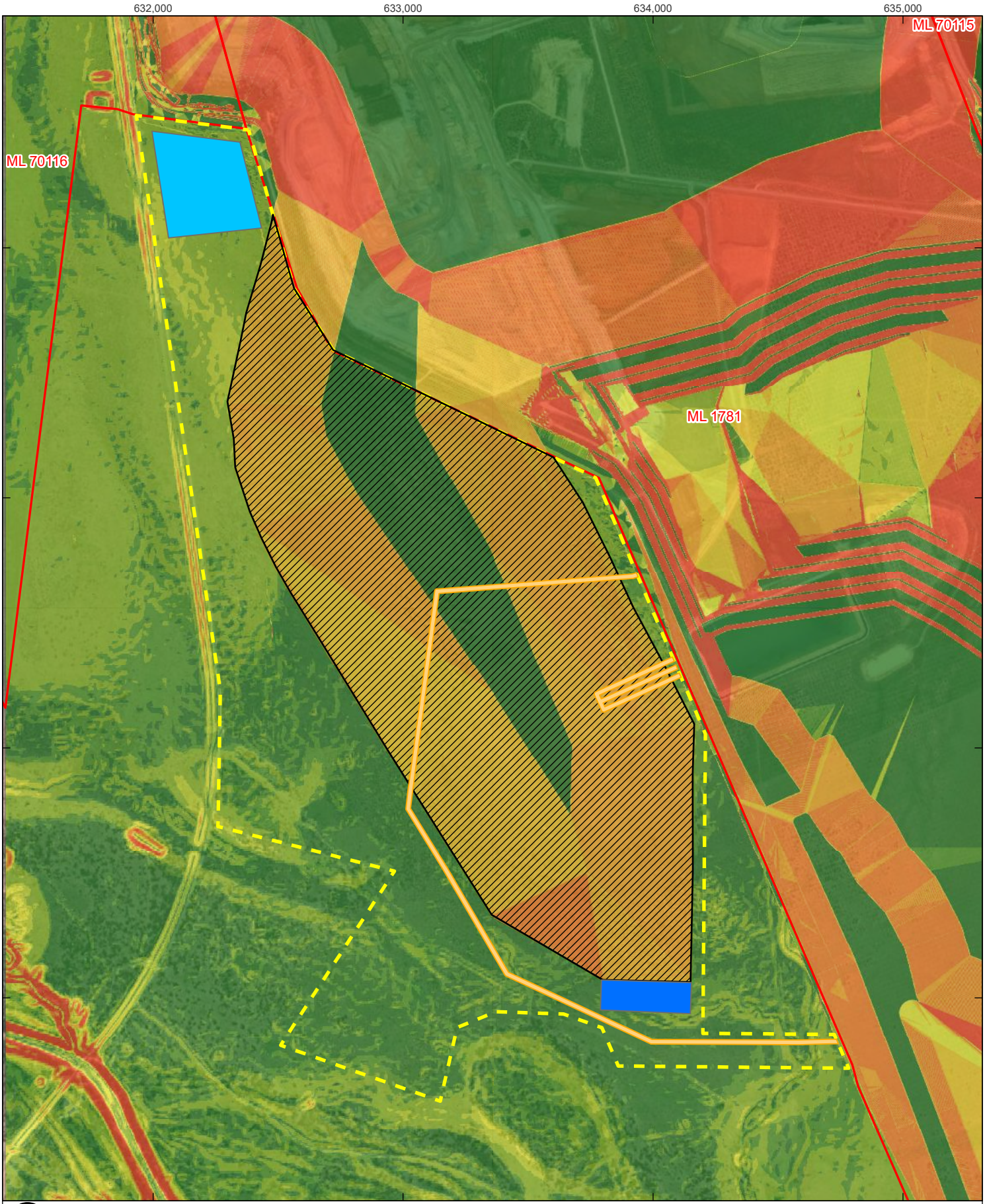
DAUNIA WEST INFRASTRUCTURE PROJECT

SOIL MAP UNITS AND FIELD SAMPLING LOCATIONS

SLR

FIGURE 4-1

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F04-01_DWIP_Soil Map Units and Field Sampling Locations



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Slope (%)

<0.5	3 - 5	10 - 12
0.5 - 1	5 - 8	12 - 15
1 - 3	8 - 10	>15

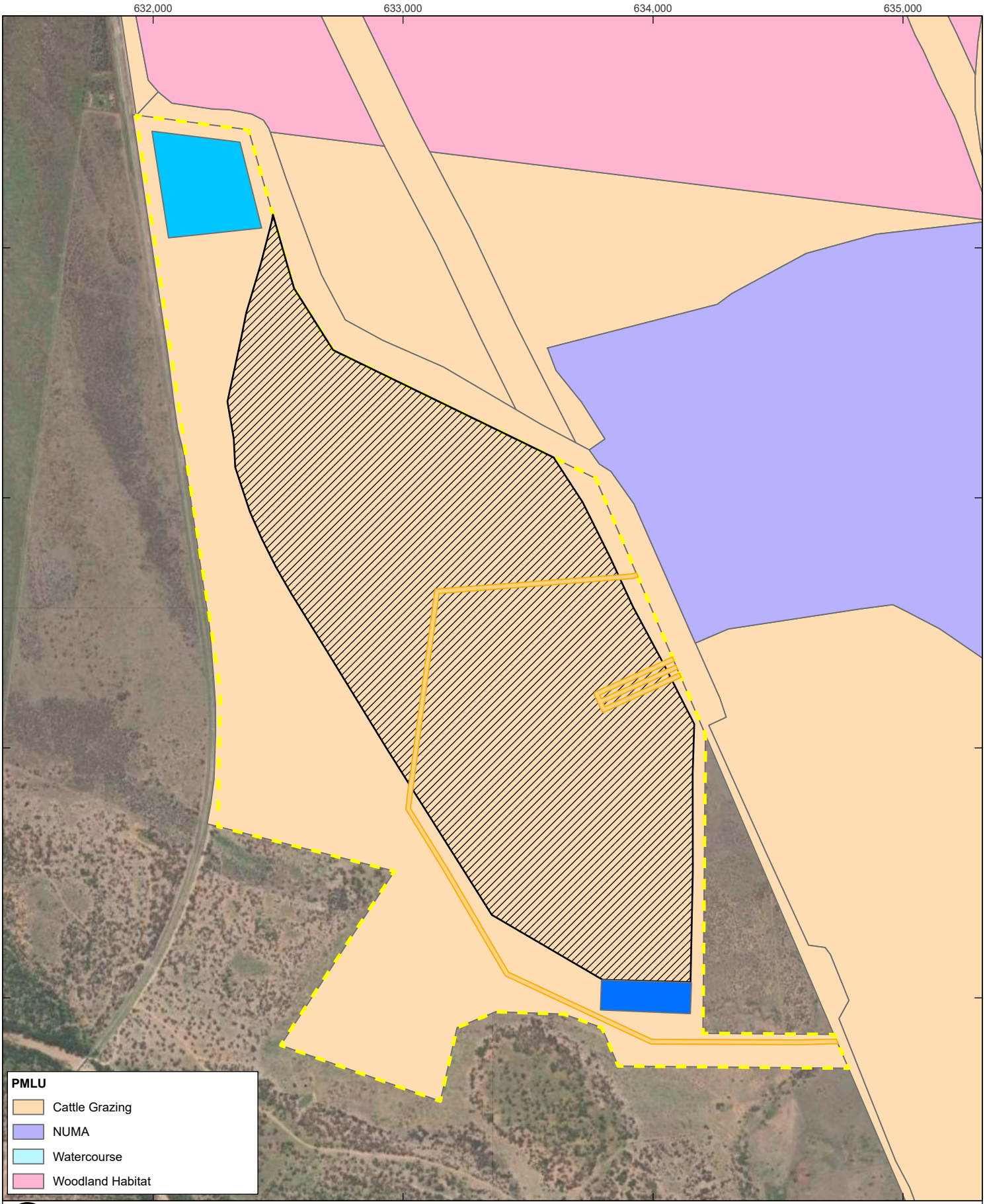
DAUNIA WEST INFRASTRUCTURE PROJECT

FINAL LANDFORM SLOPE ANALYSIS

SLR

FIGURE 5-1

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F05-01_DWIP_Final Landform Slope Analysis



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

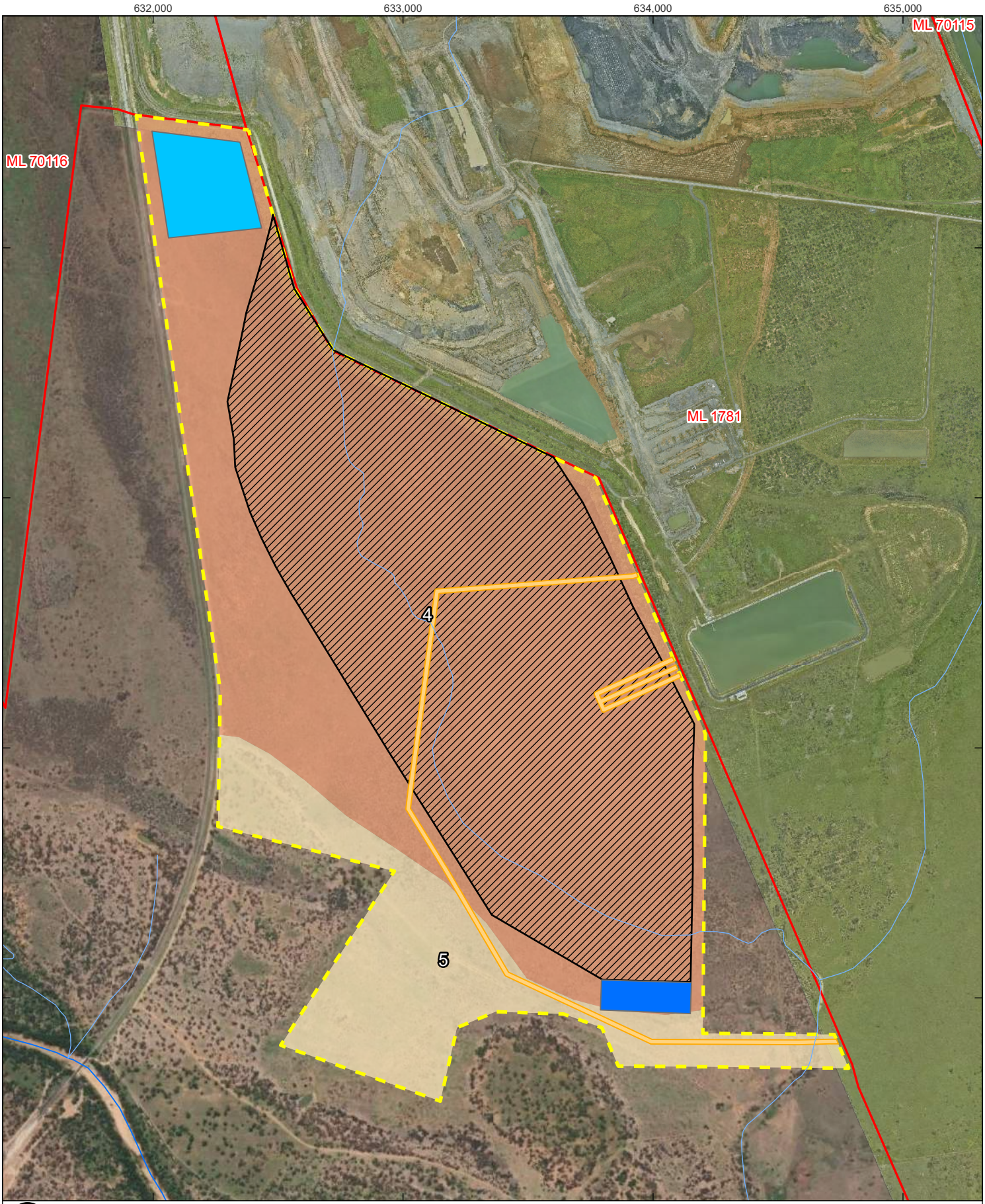
DAUNIA WEST INFRASTRUCTURE PROJECT

POST-MINING LAND USE

SLR

FIGURE 5-2

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F05-02_DWIP_PMLU



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Land Suitability Class

- 4
- 5

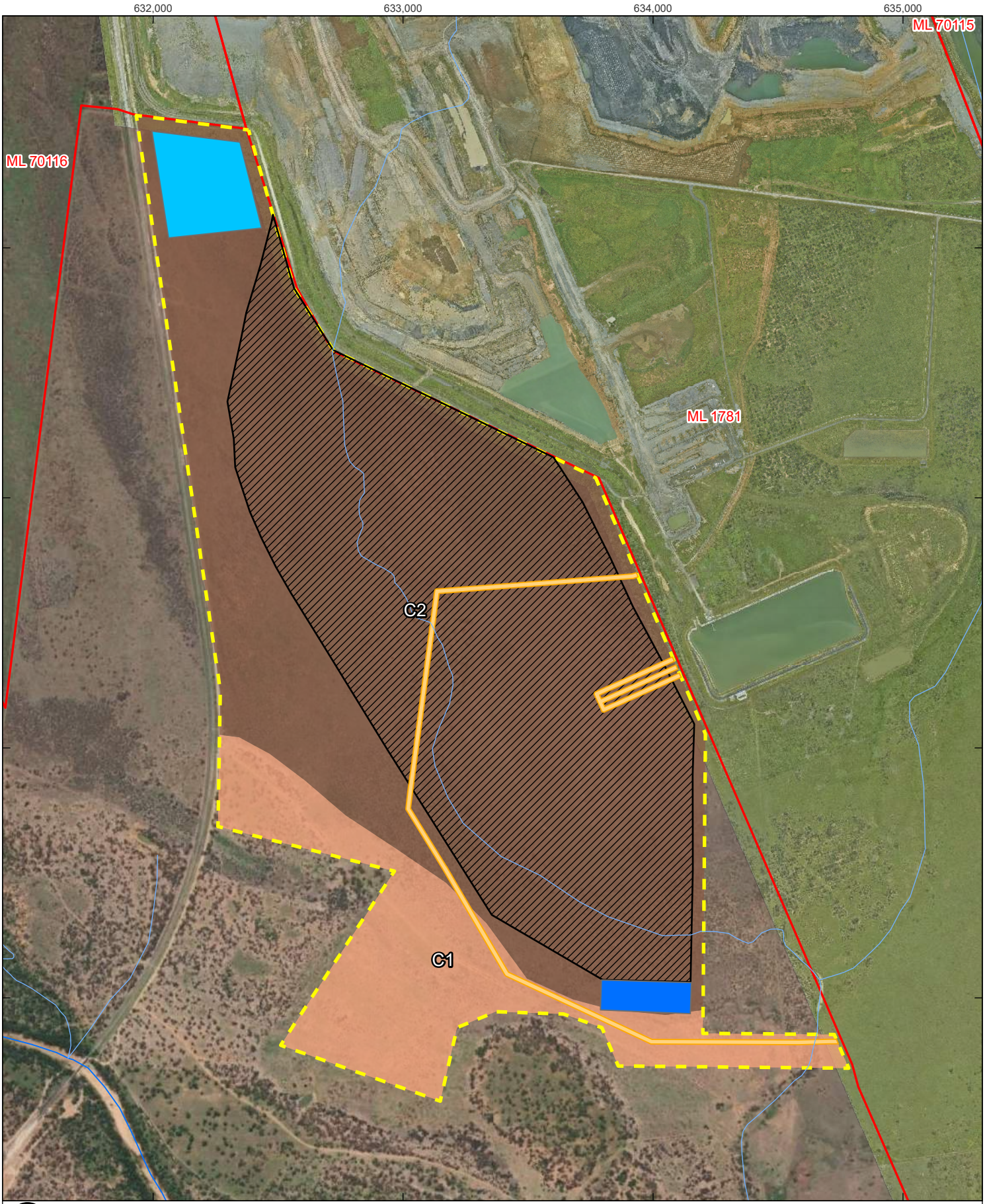
DAUNIA WEST INFRASTRUCTURE PROJECT

PRE-MINING CROPPING LAND SUITABILITY

SLR

FIGURE 6-1

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F06-01_DWIP_Pre-mining Cropping Land Suitability



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Agricultural Land Class

- C1
- C2

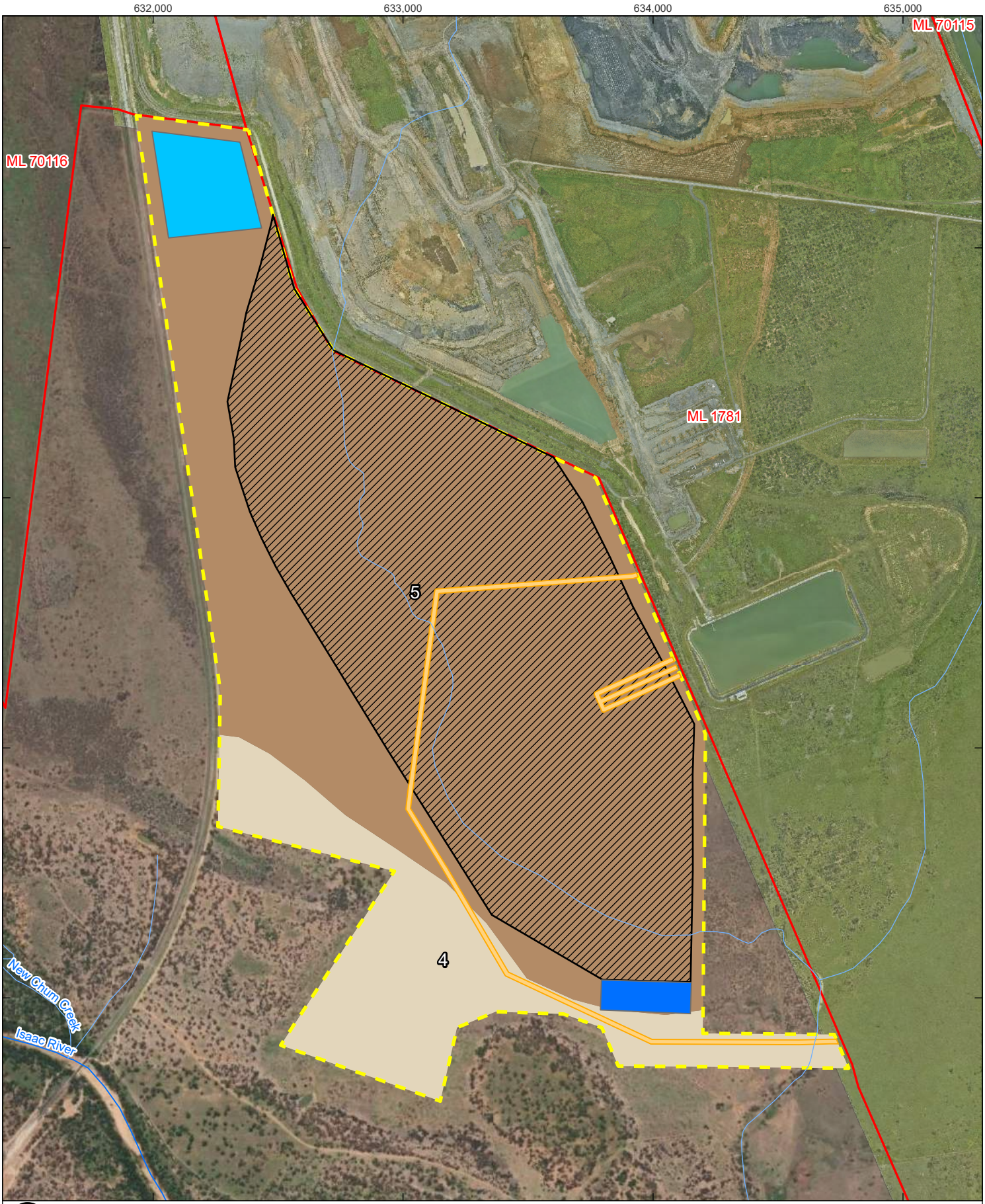
DAUNIA WEST INFRASTRUCTURE PROJECT

PRE-MINING AGRICULTURAL LAND CLASS

SLR

FIGURE 6-2

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F06-02_DWIP_Pre-mining Agricultural Land Class



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)
- Mine-affected Water Dam
- Sediment Dam
- Haul Road

Pre-mining Grazing Suitability

- 4
- 5

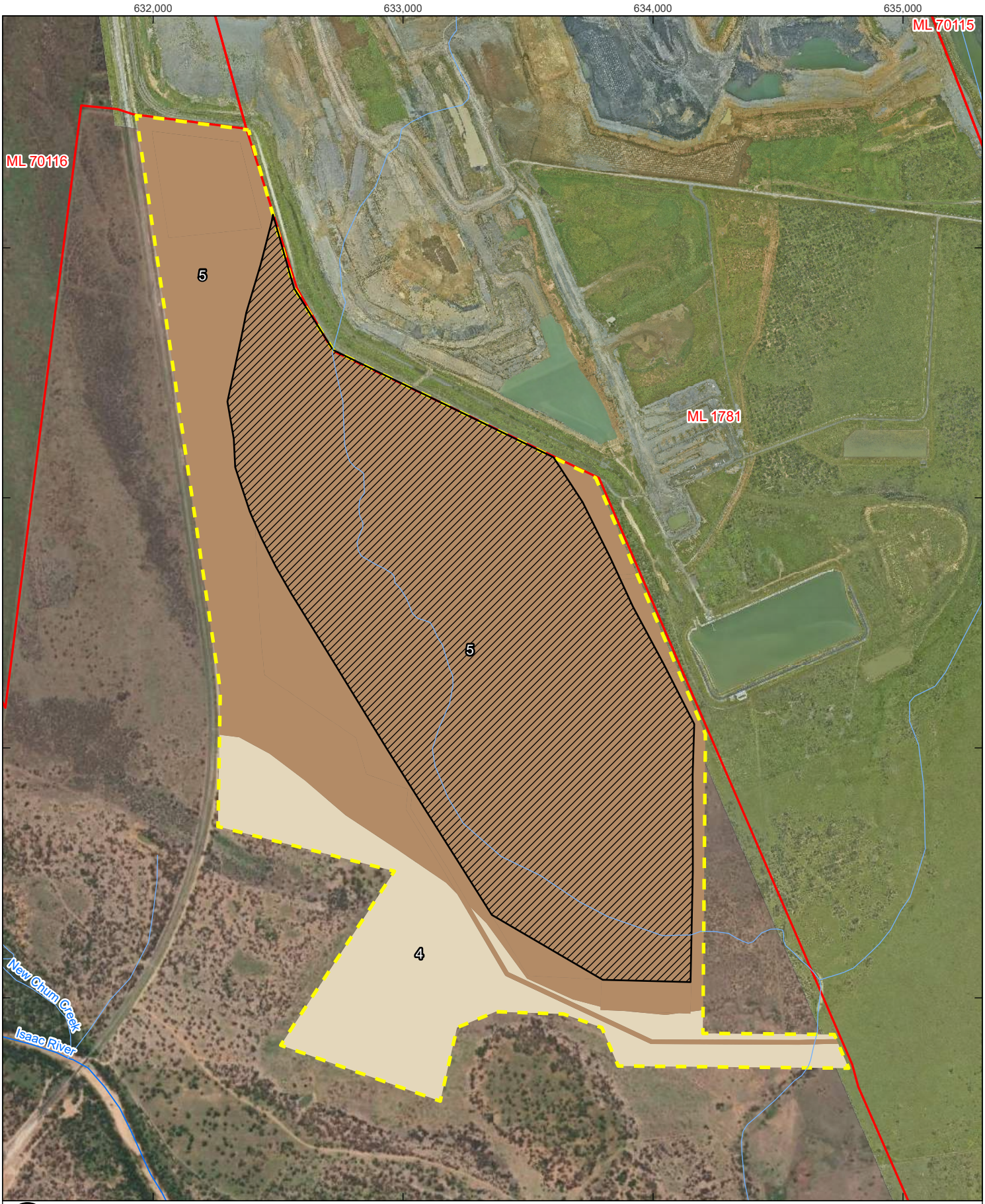
DAUNIA WEST INFRASTRUCTURE PROJECT

PRE-MINING GRAZING SUITABILITY

SLR

FIGURE 6-3

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F06-03_DWIP_Pre-mining Grazing Suitability



0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:20,000 at A4
Project Number:	620.042120.00001
Date Drawn:	29-May-2026
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Mining Lease
- Mining Lease Application Area / Project Area
- Proposed Out-of-Pit Dump (DWIP)

Post-mining Grazing Suitability

- 4
- 5

DAUNIA WEST INFRASTRUCTURE PROJECT

POST-MINING GRAZING SUITABILITY ASSESSMENT

SLR

FIGURE 6-4

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042120.00001 Daunia West Infrastructure Pro\12 SLR Data\01 GIS\GIS\Daunia West Infrastructure Project\Daunia West Infrastructure Project.aprx\620042120_LQR_F06-04_DWIP_Post-mining Grazing Suitability

Appendix B Queensland Globe – Desktop Study

Soil and Land Resource Assessment Report

Whitehaven Daunia Pty Ltd

SLR Project No.: 620.042120.00001

24 May 2026

DWIP

Areas of Regional Interest - Desktop Study

627803.44E 7559882.30N (Zone 55)

637939.06E 7559796.73N (Zone 55)

627735.90E 7551578.85N (Zone 55)

637866.16E 7551493.05N (Zone 55)

A product of Queensland Globe

Legend located on next page

N

0 1 km

Scale: 1:52641

Printed at: A4

Print date: 27/5/2025

Not suitable for accurate measurement.

Projection: Web Mercator EPSG 102100 (3857)

For more information, visit https://qldglobe.information.qld.gov.au/help-info/Contact-us.html

Queensland Government

Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development

DWIP

Areas of Regional Interest

Legend

POLYLINE-3D - 20250224 DMN West Expit Dump Contour.kmz - line

POLYGON-3D - ML_1781_70115_70116.kmz - poly

POLYGON-3D - Proposed_MLA_20250430.kmz - poly

POLYGON-3D - Proposed_OOPD_20250410.kmz - poly

SCL trigger map

Priority Living Area

Priority Agricultural Area

Strategic Environmental Area

Roads and tracks

- Motorway
- Highway
- Secondary
- Connector
- Local
- Restricted Access Road
- Mall
- Busway
- Bikeway
- Restricted Access Bikeway
- Walkway

Attribution

Earthstar Geographics

Strategic Environmental Area

Strategic Environmental Area - Designated Precinct

Railway stations

Railways

Green bridges

Bridges

Restricted Access Walkway

Non-vehicular Track

Track

Restricted Access Track

Ferry

Proposed Thoroughfare

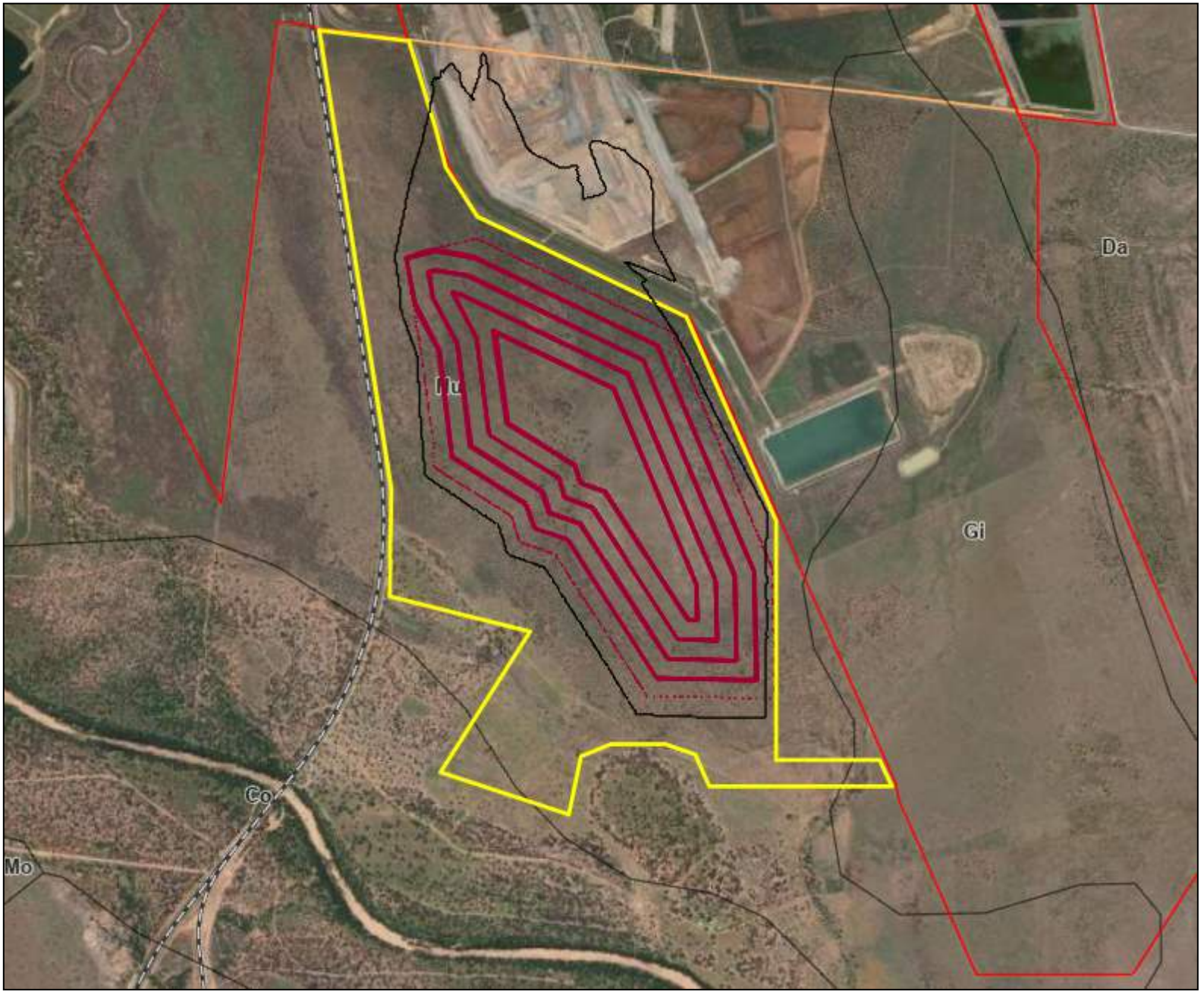
Tunnels

DWIP

Land Resource Mapping - Dekstop Study

630338.68E 7557674.09N (Zone 55)

636347.03E 7557623.13N (Zone 55)



630297.81E 7552748.62N (Zone 55)

636304.27E 7552697.58N (Zone 55)

A product of Queensland Globe

Legend located on next page

N

0 500 metres

Scale: 1:31130

Printed at: A4

Print date: 28/5/2025

Not suitable for accurate measurement.

Projection: Web Mercator EPSG 102100 (3857)

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Queensland Government

Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development

DWIP

Land Resource Mapping - Dekstop Study

Legend

POLYLINE-3D - 20250224 DMN West Expit Dump Contour.kmz - line

POLYGON-3D - ML_1781_70115_70116.kmz - poly

POLYGON-3D - Proposed_MLA_20250430.kmz - poly

POLYGON-3D - Proposed_OOPD_20250410.kmz - poly

Project boundaries best available polygon mapping

Project polygons best available polygon mapping

Roads and tracks

Motorway

Bridges

Tunnels

Railway stations

Railways

Attribution

Maxar

- Highway
- Secondary
- Connector
- Local
- Restricted Access Road
- Mall
- Busway
- Bikeway
- Restricted Access Bikeway
- Walkway
- Restricted Access Walkway
- Non-vehicular Track
- Track
- Restricted Access Track
- Ferry
- Proposed Thoroughfare

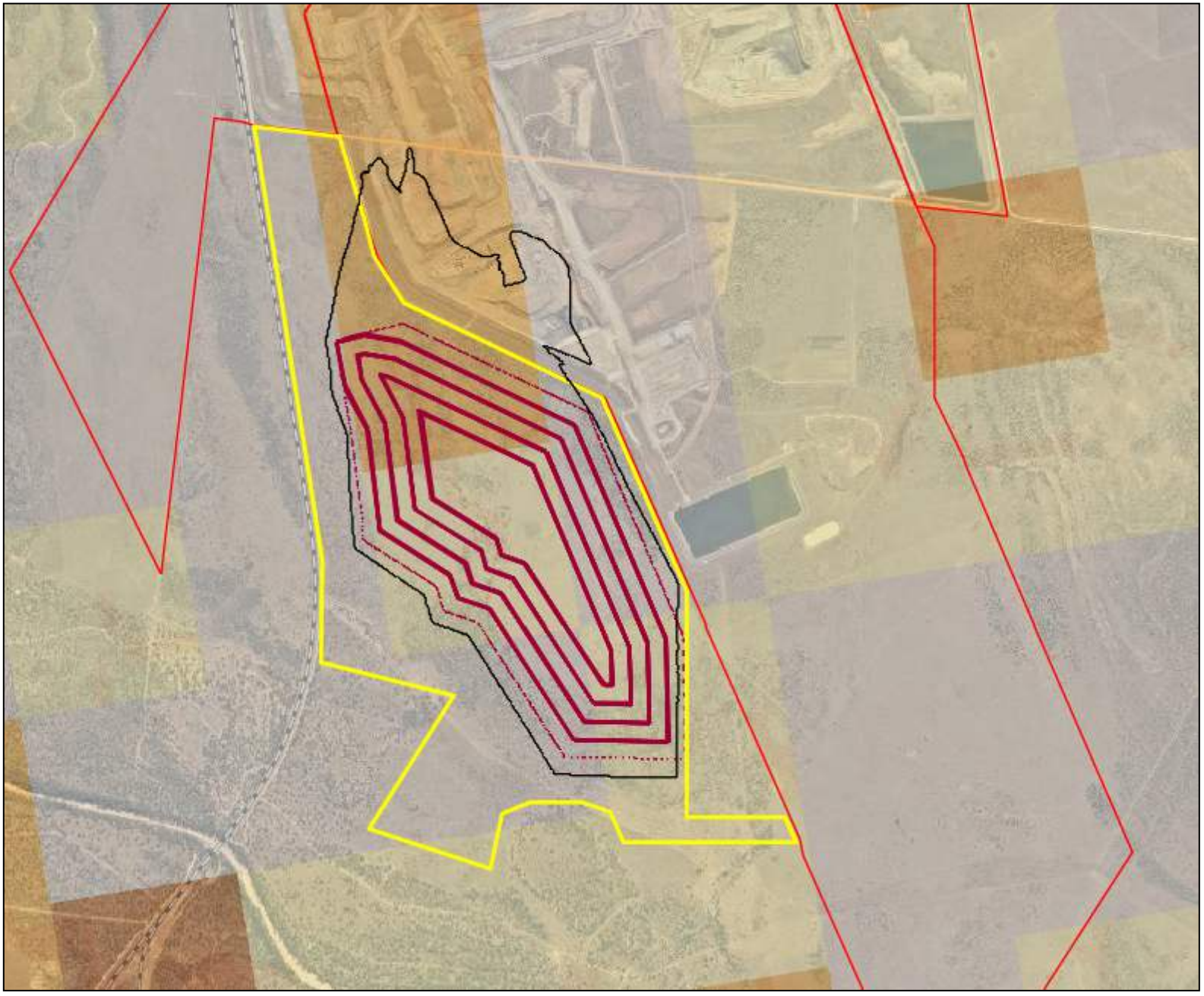
Green bridges

DWIP

Land Degradation (Erosion) - Desktop Study

630599.64E 7558188.99N (Zone 55)

636954.32E 7558134.93N (Zone 55)



630556.33E 7552979.65N (Zone 55)

636908.91E 7552925.50N (Zone 55)

A product of Queensland Globe

Legend located on next page

N

0 1 km

Scale: 1:32923

Printed at: A4

Print date: 28/5/2025

Not suitable for accurate measurement.

Projection: Web Mercator EPSG 102100 (3857)

For more information, visit https://qldglobe.information.qld.gov.au/help-info/Contact-us.html

Queensland Government

Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development

DWIP

Land Degradation (Erosion) - Desktop Study

Legend

POLYLINE-3D - 20250224 DMN West Expit Dump Contour.kmz - line

POLYGON-3D - ML_1781_70115_70116.kmz - poly

POLYGON-3D - Proposed_MLA_20250430.kmz - poly

POLYGON-3D - Proposed_OOPD_20250410.kmz - poly

Project boundary gully density mapping

Project polygons gully density mapping

- 0
- 1-10
- 11-30

Project polygons gully presence mapping- Cape York

- 0- No gully erosion
- 1- Gully erosion

Project boundary gully presence mapping- Fitzroy

Project polygons gully presence mapping- Fitzroy

- 0- No gully erosion
- 1- Gully erosion

Project boundary gully presence mapping- Mackay Whitsunday

Roads and tracks

- Motorway
- Highway
- Secondary
- Connector
- Local
- Restricted Access Road
- Mall
- Busway
- Bikeway
- Restricted Access Bikeway
- Walkway

Attribution

Maxar

31-60

61-100

Project boundary gully presence mapping- Burdekin

Project polygons gully presence mapping- Burdekin

0- No gully erosion

1- Gully erosion

Project boundary gully presence mapping- Burnett Mary

Project polygons gully presence mapping- Burnett Mary

0- No gully erosion

1- Gully erosion

Project boundary gully presence mapping- Cape York

Project polygons gully presence mapping- Mackay Whitsunday

0- No gully erosion

1- Gully erosion

Project boundary gully presence mapping- Wet Tropics

Project polygons gully presence mapping- Wet Tropics

0- No gully erosion

1- Gully erosion

Green bridges

Bridges

Tunnels

Railway stations

Restricted Access Walkway

Non-vehicular Track

Track

Restricted Access Track

Ferry

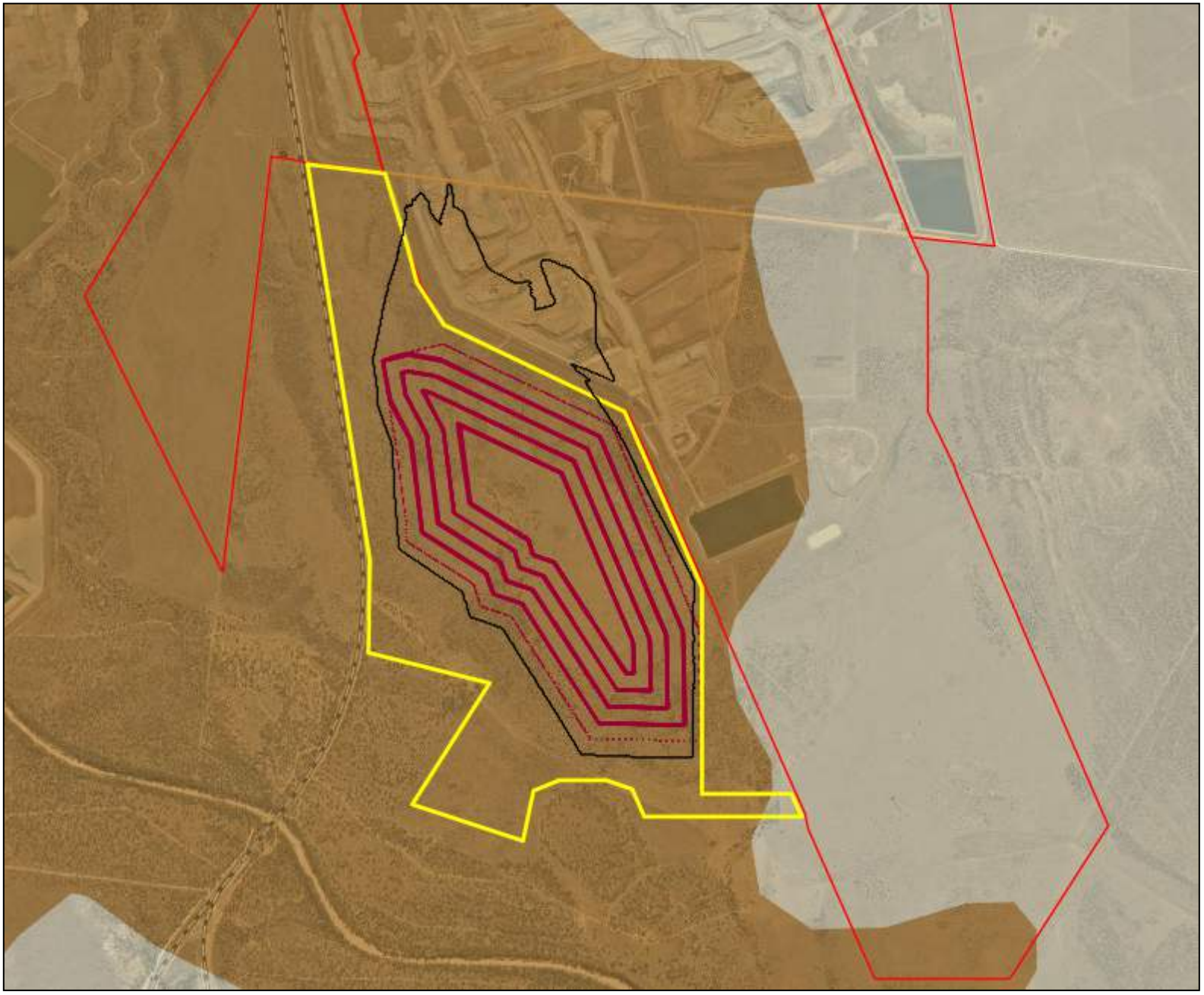
Proposed Thoroughfare

DWIP

Australian Soil Classification (ASC) - Desktop Study

630161.12E 7558475.10N (Zone 55)

637131.24E 7558415.87N (Zone 55)



630113.78E 7552761.35N (Zone 55)

637081.36E 7552702.01N (Zone 55)

A product of Queensland Globe

Legend located on next page

N

0 1 km

Scale: 1:36111

Printed at: A4

Print date: 28/5/2025

Not suitable for accurate measurement.

Projection: Web Mercator EPSG 102100 (3857)

For more information, visit https://qldglobe.information.qld.gov.au/help-info/Contact-us.html

Queensland Government

Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development

DWIP

Australian Soil Classification (ASC) - Desktop Study

Legend

POLYLINE-3D - 20250224 DMN West Expit Dump Contour.kmz - line

POLYGON-3D - ML_1781_70115_70116.kmz - poly

POLYGON-3D - Proposed_MLA_20250430.kmz - poly

POLYGON-3D - Proposed_OOPD_20250410.kmz - poly

Australian soil classification [ASC]

- Anthroposol
- Arenosol
- Calcarosol
- Chromosol
- Dermosol
- Ferrosol

Roads and tracks

- Motorway
- Highway
- Secondary
- Connector
- Local
- Restricted Access Road
- Mall
- Busway
- Bikeway
- Restricted Access Bikeway
- Walkway

Attribution

Maxar

Hydrosol

Kandosol

Kurosol

Organosol

Podosol

Rudosol

Sodosol

Tenosol

Vertosol

Green bridges

Bridges

Tunnels

Restricted Access Walkway

Non-vehicular Track

Track

Restricted Access Track

Ferry

Proposed Thoroughfare

Railway stations

Railways

Appendix C Laboratory Certificates of Analysis and Chain of Custody Form

Soil and Land Resource Assessment Report

Whitehaven Daunia Pty Ltd

SLR Project No.: 620.042120.00001

24 May 2026

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

13 samples supplied by SLR Consulting Australia Pty Ltd on 03/01/2024. Lab Job No.P9147
Analysis requested by Alex Koeman. Your Job: Job Reference: 620.31354.00000
Level 2 15 Astor Terrace BRISBANE QLD 4000

			Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
		Sample ID:	HA08 0.00 - 0.10	HA08 0.20 - 0.30	HA08 0.50 - 0.60	HA08 0.90 - 1.00	HA09 0.00 - 0.10
		Crop:	N/G	N/G	N/G	N/G	N/G
		Client:	Alex Koeman	Alex Koeman	Alex Koeman	Alex Koeman	Alex Koeman
	Parameter	Method reference	P9147/1	P9147/2	P9147/3	P9147/4	P9147/5
	Phosphorus (mg/kg P)	**Rayment & Lyons 2011 - 9E2 (Bray 1)	7.2	3.5	<1	<1	12.3
		**Rayment & Lyons 2011 - 9B2 (Colwell)	20	13	2.9	3.0	21
	Nitrate Nitrogen (mg/kg N)	**Inhouse S37 (KCl)	4.3	4.6	4.1	3.7	9.8
	Ammonium Nitrogen (mg/kg N)		2.9	2.1	0.36	0.70	2.1
	Sulfur (mg/kg S)		<1	12	25	30	3.3
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.22	8.25	8.81	8.69	8.31
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.108	0.276	0.442	0.562	0.132
	Estimated Organic Matter (% OM)	**Calculation: Total Carbon x 1.75	2.7	2.2	1.7	2.0	2.1
	Exchangeable Calcium (cmol$_c$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	12	21	22	22	5.0
	Exchangeable Calcium (kg/ha)		5,326	9,385	10,068	10,048	2,251
	Exchangeable Calcium (mg/kg)		2,378	4,190	4,495	4,486	1,005
	Exchangeable Magnesium (cmol$_c$/kg)		6.6	8.8	11	11	1.8
	Exchangeable Magnesium (kg/ha)		1,810	2,406	3,019	3,096	492
	Exchangeable Magnesium (mg/kg)		808	1,074	1,348	1,382	220
	Exchangeable Potassium (cmol$_c$/kg)		0.95	0.72	0.52	0.45	3.1
	Exchangeable Potassium (kg/ha)		832	630	454	393	2,693
	Exchangeable Potassium (mg/kg)		371	281	203	175	1,202
	Exchangeable Sodium (cmol$_c$/kg)		0.63	1.7	3.6	4.3	0.13
	Exchangeable Sodium (kg/ha)		323	855	1,846	2,194	67
	Exchangeable Sodium (mg/kg)		144	382	824	980	30
	Exchangeable Aluminium (cmol$_c$/kg)	**Inhouse S37 (KCl)	0.03	0.03	0.03	0.04	0.04
	Exchangeable Aluminium (kg/ha)		5.3	6.1	5.8	7.2	7.1
	Exchangeable Aluminium (mg/kg)		2.4	2.7	2.6	3.2	3.2
	Exchangeable Hydrogen (cmol$_c$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_c$/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_c$/kg)	20	32	38	39	10
	Calcium (%)	**Base Saturation Calculations - Cation cmol$_c$/kg / ECEC x 100	59	65	60	58	50
	Magnesium (%)		33	27	29	30	18
	Potassium (%)		4.7	2.2	1.4	1.2	31
	Sodium - ESP (%)		3.1	5.2	9.5	11	1.3
	Aluminium (%)		0.13	0.09	0.08	0.09	0.35
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol$_c$/kg)	1.8	2.4	2.0	2.0	2.8

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AGRICULTURAL SOIL ANALYSIS REPORT

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Analysis requested by Alex Koeman. Your Job: Job Reference: 620.31354.00000
Level 2 15 Astor Terrace BRISBANE QLD 4000

	Parameter	Method reference	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
	Sample ID:		**HA08 0.00 - 0.10**	**HA08 0.20 - 0.30**	**HA08 0.50 - 0.60**	**HA08 0.90 - 1.00**	**HA09 0.00 - 0.10**
	Crop:		**N/G**	**N/G**	**N/G**	**N/G**	**N/G**
	Client:		**Alex Koeman**	**Alex Koeman**	**Alex Koeman**	**Alex Koeman**	**Alex Koeman**
	Parameter	**Method reference**	**P9147/1**	**P9147/2**	**P9147/3**	**P9147/4**	**P9147/5**
	Zinc (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	0.92	<0.5	<0.5	<0.5	0.79
	Manganese (mg/kg)		45	18	5.6	7.4	13
	Iron (mg/kg)		37	19	6.8	7.8	35
	Copper (mg/kg)		1.4	1.1	0.93	0.98	0.47
	Boron (mg/kg)	**Rayment & Lyons 2011 - 12C2 (Hot $CaCl_2$)	0.31	0.28	0.85	0.89	0.23
	Silicon (mg/kg Si)	**Inhouse S11 (Hot CaCl2)	36	20	12	8.7	73
	Total Carbon (%)	Inhouse S4a (LECO Trumac Analyser)	1.5	1.3	1.00	1.2	1.2
	Total Nitrogen (%)		0.13	0.10	0.07	0.08	0.11
	Carbon/Nitrogen Ratio	**Calculation: Total Carbon/Total Nitrogen	12	13	14	15	11
	Basic Texture	**Inhouse S65	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam
	Basic Colour		Brownish	Brownish	Brownish	Brownish	Brownish
	Chloride Estimate (equiv. mg/kg)	**Calculation: Electrical Conductivity x 640	69	177	283	360	84
	Total Organic Carbon (%)	LECO Trumac Analyser - Inhouse S15b	1.52	1.20	0.96	0.77	1.21
	pH	**Rayment & Lyons 2011 - 4B4 ($CaCl_2$)	6.8	7.7	8.1	8.0	7.4
	Emerson Aggregate Test (EAT)	**AS1289.3.8.1-2017	3	3	4	3	3

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.
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17. This report was issued on 15/01/2024.

Quality Checked: Kris Saville
Agricultural Co-Ordinator

Accreditation No. 14960
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Analysis requested by Alex Koeman. Your Job: Job Reference: 620.31354.00000
Level 2 15 Astor Terrace BRISBANE QLD 4000

			Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
		Sample ID:	HA09 0.20 - 0.30	HA09 0.50 - 0.60	HA09 0.90 - 1.00	HA13 0.00 - 0.10	HA13 0.20 - 0.30
		Crop:	N/G	N/G	N/G	N/G	N/G
		Client:	Alex Koeman	Alex Koeman	Alex Koeman	Alex Koeman	Alex Koeman
	Parameter	Method reference	P9147/6	P9147/7	P9147/8	P9147/9	P9147/10
	Phosphorus (mg/kg P)	**Rayment & Lyons 2011 - 9E2 (Bray 1)	2.7	1.2	1.1	13.3	8.4
		**Rayment & Lyons 2011 - 9B2 (Colwell)	6.0	4.2	3.6	21	12
	Nitrate Nitrogen (mg/kg N)	**Inhouse S37 (KCl)	7.7	0.92	0.89	4.2	1.4
	Ammonium Nitrogen (mg/kg N)		0.50	0.34	1.7	10	3.5
	Sulfur (mg/kg S)		5.9	4.7	4.4	8.1	4.4
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.72	6.65	6.65	6.79	7.26
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.047	0.012	0.012	0.006	0.087
	Estimated Organic Matter (% OM)	**Calculation: Total Carbon x 1.75	0.98	0.55	0.37	4.0	1.2
	Exchangeable Calcium (cmol$_c$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	3.5	4.1	3.6	6.7	3.5
	Exchangeable Calcium (kg/ha)		1,551	1,862	1,594	3,008	1,556
	Exchangeable Calcium (mg/kg)		693	831	712	1,343	695
	Exchangeable Magnesium (cmol$_c$/kg)		1.4	1.6	1.3	2.0	1.0
	Exchangeable Magnesium (kg/ha)		393	446	356	538	275
	Exchangeable Magnesium (mg/kg)		175	199	159	240	123
	Exchangeable Potassium (cmol$_c$/kg)		0.75	0.58	0.41	0.59	0.41
	Exchangeable Potassium (kg/ha)		657	505	360	517	359
	Exchangeable Potassium (mg/kg)		293	225	161	231	160
	Exchangeable Sodium (cmol$_c$/kg)		<0.065	<0.065	<0.065	<0.065	<0.065
	Exchangeable Sodium (kg/ha)		<33	<33	<33	<33	<33
	Exchangeable Sodium (mg/kg)		<15	<15	<15	<15	<15
	Exchangeable Aluminium (cmol$_c$/kg)	**Inhouse S37 (KCl)	0.02	0.02	0.02	0.05	0.04
	Exchangeable Aluminium (kg/ha)		4.2	4.7	3.5	11	8.3
	Exchangeable Aluminium (mg/kg)		1.9	2.1	1.5	4.7	3.7
	Exchangeable Hydrogen (cmol$_c$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_c$/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_c$/kg)	5.7	6.4	5.3	9.3	4.9
	Calcium (%)	**Base Saturation Calculations - Cation cmol$_c$/kg / ECEC x 100	61	65	67	72	70
	Magnesium (%)		25	25	25	21	20
	Potassium (%)		13	9.0	7.7	6.3	8.3
	Sodium - ESP (%)		0.36	0.64	0.72	0.15	0.18
	Aluminium (%)		0.37	0.36	0.32	0.56	0.83
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol$_c$/kg)	2.4	2.5	2.7	3.4	3.4

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Analysis requested by Alex Koeman. Your Job: Job Reference: 620.31354.00000
Level 2 15 Astor Terrace BRISBANE QLD 4000

			Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
		Sample ID:	HA09 0.20 - 0.30	HA09 0.50 - 0.60	HA09 0.90 - 1.00	HA13 0.00 - 0.10	HA13 0.20 - 0.30
		Crop:	N/G	N/G	N/G	N/G	N/G
		Client:	Alex Koeman	Alex Koeman	Alex Koeman	Alex Koeman	Alex Koeman
	Parameter	Method reference	P9147/6	P9147/7	P9147/8	P9147/9	P9147/10
	Zinc (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	<0.5	<0.5	<0.5	2.1	0.61
	Manganese (mg/kg)		15	12	16	27	14
	Iron (mg/kg)		31	25	19	69	34
	Copper (mg/kg)		0.60	0.66	0.67	0.26	0.21
	Boron (mg/kg)	**Rayment & Lyons 2011 - 12C2 (Hot $CaCl_2$)	0.12	<0.1	<0.1	0.32	0.17
	Silicon (mg/kg Si)	**Inhouse S11 (Hot CaCl2)	59	42	38	69	40
	Total Carbon (%)	Inhouse S4a (LECO Trumac Analyser)	0.56	0.31	0.21	2.3	0.66
	Total Nitrogen (%)		0.07	0.04	0.05	0.18	0.06
	Carbon/Nitrogen Ratio	**Calculation: Total Carbon/Total Nitrogen	8.5	8.0	4.1	13	11
	Basic Texture	**Inhouse S65	Loam	Loam	Loam	Loam	Loam
	Basic Colour		Brownish	Brownish	Brownish	Brownish	Brownish
	Chloride Estimate (equiv. mg/kg)	**Calculation: Electrical Conductivity x 640	30	7.7	7.7	3.8	56
	Total Organic Carbon (%)	LECO Trumac Analyser - Inhouse S15b	0.56	0.31	0.21	1.98	0.66
	pH	**Rayment & Lyons 2011 - 4B4 ($CaCl_2$)	6.1	5.9	5.9	6.6	6.5
	Emerson Aggregate Test (EAT)	**AS1289.3.8.1-2017	3	3	3	4	3

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'.
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			Sample 11	Sample 12	Sample 13
		Sample ID:	HA13 0.5 - 0.60	HA13 0.70 - 0.80	HA13 0.90 - 1.00
		Crop:	N/G	N/G	N/G
		Client:	Alex Koeman	Alex Koeman	Alex Koeman
	Parameter	Method reference	P9147/11	P9147/12	P9147/13
	Phosphorus (mg/kg P)	**Rayment & Lyons 2011 - 9E2 (Bray 1)	5.2	4.6	3.1
		**Rayment & Lyons 2011 - 9B2 (Colwell)	7.5	6.7	5.7
	Nitrate Nitrogen (mg/kg N)	**Inhouse S37 (KCl)	0.51	0.19	0.18
	Ammonium Nitrogen (mg/kg N)		1.9	1.8	1.8
	Sulfur (mg/kg S)		6.2	6.3	11
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.62	7.74	7.74
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.020	0.016	0.014
	Estimated Organic Matter (% OM)	**Calculation: Total Carbon x 1.75	0.37	0.21	0.21
	Exchangeable Calcium (cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	1.8	1.3	1.1
	Exchangeable Calcium (kg/ha)		788	571	478
	Exchangeable Calcium (mg/kg)		352	255	214
	Exchangeable Magnesium (cmol$_+$/kg)		0.50	0.43	0.38
	Exchangeable Magnesium (kg/ha)		135	116	105
	Exchangeable Magnesium (mg/kg)		60	52	47
	Exchangeable Potassium (cmol$_+$/kg)		0.46	0.41	0.37
	Exchangeable Potassium (kg/ha)		403	363	325
	Exchangeable Potassium (mg/kg)		180	162	145
	Exchangeable Sodium (cmol$_+$/kg)		<0.065	<0.065	<0.065
	Exchangeable Sodium (kg/ha)		<33	<33	<33
	Exchangeable Sodium (mg/kg)		<15	<15	<15
	Exchangeable Aluminium (cmol$_+$/kg)	**Inhouse S37 (KCl)	0.02	0.01	0.01
	Exchangeable Aluminium (kg/ha)		3.2	2.9	2.3
	Exchangeable Aluminium (mg/kg)		1.4	1.3	1.0
	Exchangeable Hydrogen (cmol$_+$/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	2.8	2.1	1.8
	Calcium (%)	**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	64	59	58
	Magnesium (%)		18	20	21
	Potassium (%)		17	19	20
	Sodium - ESP (%)		1.1	0.54	0.50
	Aluminium (%)		0.58	0.67	0.62
	Hydrogen (%)		0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol$_+$/kg)	3.5	3.0	2.8

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			Sample 11	Sample 12	Sample 13
		Sample ID:	HA13 0.5 - 0.60	HA13 0.70 - 0.80	HA13 0.90 - 1.00
		Crop:	N/G	N/G	N/G
		Client:	Alex Koeman	Alex Koeman	Alex Koeman
	Parameter	Method reference	P9147/11	P9147/12	P9147/13
	Zinc (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	<0.5	<0.5	<0.5
	Manganese (mg/kg)		8.7	6.3	5.6
	Iron (mg/kg)		10	2.7	2.8
	Copper (mg/kg)		0.28	0.25	0.21
	Boron (mg/kg)	**Rayment & Lyons 2011 - 12C2 (Hot $CaCl_2$)	0.15	0.16	0.14
	Silicon (mg/kg Si)	**Inhouse S11 (Hot CaCl2)	18	17	14
	Total Carbon (%)	Inhouse S4a (LECO Trumac Analyser)	0.21	0.12	0.12
	Total Nitrogen (%)		0.03	0.03	0.03
	Carbon/Nitrogen Ratio	**Calculation: Total Carbon/Total Nitrogen	6.4	4.4	4.2
	Basic Texture	**Inhouse S65	Loam	Sandy Soil	Sandy Soil
	Basic Colour		Brownish	Brownish	Brownish
	Chloride Estimate (equiv. mg/kg)	**Calculation: Electrical Conductivity x 640	13	10	9.0
	Total Organic Carbon (%)	LECO Trumac Analyser - Inhouse S15b	0.20	0.12	0.10
	pH	**Rayment & Lyons 2011 - 4B4 ($CaCl_2$)	6.9	7.0	7.0
	Emerson Aggregate Test (EAT)	**AS1289.3.8.1-2017	3	3	3

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).
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	Parameter		Method reference	Heavy Soil	Medium Soil	Light Soil	Sandy Soil
	Sample ID:						
	Crop:						
	Client:			Clay	Clay Loam	Loam	Loamy Sand
	Parameter		**Method reference**	**Indicative guidelines - refer to Notes 6 and 8**			
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	45 note 5	30 note 5	24 note 5	20 note 5
			**Rayment & Lyons 2011 - 9B2 (Colwell)	80	50	45	35
	Nitrate Nitrogen (mg/kg N)		**Inhouse S37 (KCl)	15	13	10	10
	Ammonium Nitrogen (mg/kg N)			20	18	15	12
	Sulfur (mg/kg S)			10.0	8.0	8.0	7.0
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.5	6.5	6.3	6.3
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.200	0.150	0.120	0.100
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	> 5.5	>4 .5	> 3.5	> 2.5
	Exchangeable Calcium	**(cmol$_c$/kg)**	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	15.6	10.8	5.0	1.9
		(kg/ha)		7000	4816	2240	840
		(mg/kg)		3125	2150	1000	375
	Exchangeable Magnesium	**(cmol$_c$/kg)**		2.4	1.7	1.2	0.60
		(kg/ha)		650	448	325	168
		(mg/kg)		290	200	145	75
	Exchangeable Potassium	**(cmol$_c$/kg)**		0.60	0.50	0.40	0.30
		(kg/ha)		526	426	336	224
		(mg/kg)		235	190	150	100
	Exchangeable Sodium	**(cmol$_c$/kg)**		0.3	0.26	0.22	0.11
		(kg/ha)		155	134	113	57
		(mg/kg)		69	60	51	25
	Exchangeable Aluminium	**(cmol$_c$/kg)**	**Inhouse S37 (KCl)	0.6	0.5	0.4	0.2
		(kg/ha)		121	101	73	30
		(mg/kg)		54	45	32	14
	Exchangeable Hydrogen	**(cmol$_c$/kg)**	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	0.6	0.5	0.4	0.2
		(kg/ha)		13	11	8	3
		(mg/kg)		6	5	4	2
	Effective Cation Exchange Capacity (ECEC) (cmol$_c$/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_c$/kg)	20.1	14.3	7.8	3.3
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_c$/kg / ECEC x 100	77.6	75.7	65.6	57.4
	Magnesium (%)			11.9	11.9	15.7	18.1
	Potassium (%)			3.0	3.5	5.2	9.1
	Sodium - ESP (%)			1.5	1.8	2.9	3.3
	Aluminium (%)			6.0	7.1	10.5	12.1
	Hydrogen (%)						
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_c$/kg)	6.5	6.4	4.2	3.2

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AGRICULTURAL SOIL ANALYSIS REPORT

13 samples supplied by SLR Consulting Australia Pty Ltd on 03/01/2024. Lab Job No.P9147

Analysis requested by Alex Koeman. Your Job: Job Reference: 620.31354.00000

Level 2 15 Astor Terrace BRISBANE QLD 4000

	Parameter	Method reference	Heavy Soil	Medium Soil	Light Soil	Sandy Soil
	Sample ID:					
	Crop:					
	Client:		Clay	Clay Loam	Loam	Loamy Sand
			Indicative guidelines - refer to Notes 6 and 8			
	Zinc (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	6.0	5.0	4.0	3.0
	Manganese (mg/kg)		25	22	18	15
	Iron (mg/kg)		25	22	18	15
	Copper (mg/kg)		2.4	2.0	1.6	1.2
	Boron (mg/kg)	**Rayment & Lyons 2011 - 12C2 (Hot $CaCl_2$)	2.0	1.7	1.4	1.0
	Silicon (mg/kg Si)	**Inhouse S11 (Hot CaCl2)	50	45	40	35
	Total Carbon (%)	Inhouse S4a (LECO Trumac Analyser)	> 3.1	> 2.6	> 2.0	> 1.4
	Total Nitrogen (%)		> 0.30	> 0.25	> 0.20	> 0.15
	Carbon/Nitrogen Ratio	**Calculation: Total Carbon/Total Nitrogen	10–12	10–12	10–12	10–12
	Basic Texture	**Inhouse S65	..	..	..	..
	Basic Colour		..	..	..	..
	Chloride Estimate (equiv. mg/kg)	**Calculation: Electrical Conductivity x 640	..	..	..	..
	Total Organic Carbon (%)	LECO Trumac Analyser - Inhouse S15b	< 0.5 (Very Low); 0.5–1.5 (Low); 1.5–2.5 (Medium); 2.5–5.0 (High); > 5.0 (Very High)			
	pH	**Rayment & Lyons 2011 - 4B4 ($CaCl_2$)	..			
	Emerson Aggregate Test (EAT)	**AS1289.3.8.1-2017	Class 3–8			

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: 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.
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16. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions
17. This report was issued on 15/01/2024.

Quality Checked: Kris Saville
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AGRICULTURAL SOIL ANALYSIS REPORT

24 samples supplied by SLR Consulting Australia Pty Ltd on 10/06/2021. Lab Job No.K7940
Analysis requested by Alex Koeman. Your Job: PO ù 620.30245.00120
Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
		Sample ID:	HA01_0-10	HA01_20-30	HA01_50-60	HA01_90-100	HA02_0-10	HA02_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	K7940/1	K7940/2	K7940/3	K7940/4	K7940/5	K7940/6
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	1.5	1.6	1.4	1.3	2.6	2.0
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.85	7.05	7.15	7.08	7.21	7.28
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.174	0.189	0.484	0.787	0.168	0.204
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	2.8	2.8	2.2	2.3	2.7	2.5
	Exchangeable Calcium	(cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	35	33	28	27	28	26
		(kg/ha)		15,610	14,716	12,470	11,910	12,646	11,727
		(mg/kg)		6,969	6,570	5,567	5,317	5,646	5,235
	Exchangeable Magnesium	(cmol+/kg)		7.5	7.8	12	14	6.6	8.0
		(kg/ha)		2,038	2,134	3,335	3,883	1,788	2,184
		(mg/kg)		910	953	1,489	1,733	798	975
	Exchangeable Potassium	(cmol+/kg)		0.59	0.68	0.53	0.55	0.67	0.60
		(kg/ha)		520	595	462	484	589	526
		(mg/kg)		232	265	206	216	263	235
	Exchangeable Sodium	(cmol+/kg)		0.81	1.1	4.9	7.2	0.73	1.3
		(kg/ha)		419	578	2,502	3,732	377	691
		(mg/kg)		187	258	1,117	1,666	168	308
	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	<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)	44	42	45	49	36	36
	Calcium (%)		**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	80	77	61	55	78	72
	Magnesium (%)			17	18	27	29	18	22
	Potassium (%)			1.4	1.6	1.2	1.1	1.9	1.7
	Sodium - ESP (%)			1.9	2.6	11	15	2.0	3.7
	Aluminium (%)			0.01	0.01	0.00	0.01	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)	4.6	4.2	2.3	1.9	4.3	3.3
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	1.6	1.6	1.3	1.3	1.6	1.4
	Total Nitrogen (%)			0.15	0.11	0.08	0.09	0.13	0.13
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	11	15	15	14	12	11
	Basic Texture		**Inhouse S65	Clay	Clay	Clay	Clay	Clay	Clay
	Basic Colour			Brownish	Brownish	Brownish	Brownish	Brownish	Brownish
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	112	121	309	504	108	130
	Emerson Aggregate Test (EAT)		**AS1289.3.8.1-2017	4	4	4	4	4	4

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AGRICULTURAL SOIL ANALYSIS REPORT

24 samples supplied by SLR Consulting Australia Pty Ltd on 10/06/2021. Lab Job No.K7940
Analysis requested by Alex Koeman. Your Job: PO ù 620.30245.00120
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
	Sample ID:	HA01_0-10	HA01_20-30	HA01_50-60	HA01_90-100	HA02_0-10	HA02_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	K7940/1	K7940/2	K7940/3	K7940/4	K7940/5	K7940/6

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.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
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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
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17. This report was issued on 21/06/2021.

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Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

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Analysis requested by Alex Koeman. Your Job: PO ù 620.30245.00120
Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
		Sample ID:	HA02_50-60	HA02_90-100	HA03_0-10	HA03_20-30	HA03_50-60	HA03_90-100
		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	K7940/7	K7940/8	K7940/9	K7940/10	K7940/11	K7940/12
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	1.9	1.6	4.7	1.2	1.3	1.6
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.18	6.93	6.71	6.95	7.23	7.22
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.596	1.243	0.039	0.155	0.365	0.578
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	2.1	1.2	1.2	0.79	0.71	1.4
	Exchangeable Calcium	(cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	22	21	5.0	9.9	11	12
		(kg/ha)		10,036	9,455	2,229	4,426	5,019	5,360
		(mg/kg)		4,480	4,221	995	1,976	2,241	2,393
	Exchangeable Magnesium	(cmol$_+$/kg)		12	14	2.0	7.8	8.1	8.1
		(kg/ha)		3,215	3,805	533	2,127	2,215	2,203
		(mg/kg)		1,435	1,699	238	950	989	983
	Exchangeable Potassium	(cmol$_+$/kg)		0.53	0.54	0.32	0.36	0.33	0.36
		(kg/ha)		461	469	278	314	290	318
		(mg/kg)		206	209	124	140	130	142
	Exchangeable Sodium	(cmol$_+$/kg)		4.7	7.7	0.10	1.1	2.0	2.9
		(kg/ha)		2,415	3,984	53	576	1,008	1,501
		(mg/kg)		1,078	1,779	24	257	450	670
	Exchangeable Aluminium	(cmol$_+$/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		(kg/ha)		<1	1.0	1.6	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)	39	43	7.4	19	22	23
	Calcium (%)		**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	57	49	68	51	52	51
	Magnesium (%)			30	32	27	41	38	35
	Potassium (%)			1.3	1.2	4.3	1.9	1.5	1.6
	Sodium - ESP (%)			12	18	1.4	5.8	9.1	13
	Aluminium (%)			0.01	0.01	0.11	0.03	0.02	0.02
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol$_+$/kg)	1.9	1.5	2.5	1.3	1.4	1.5
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	1.2	0.70	0.67	0.45	0.40	0.83
	Total Nitrogen (%)			0.14	0.10	0.13	0.04	0.02	<0.02
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	8.4	7.0	5.1	12	17	44
	Basic Texture		**Inhouse S65	Clay	Clay	Loam	Clay Loam	Clay Loam	Clay Loam
	Basic Colour			Brownish	Brownish	Brownish	Brownish	Brownish	Brownish
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	381	796	25	99	234	370
	Emerson Aggregate Test (EAT)		**AS1289.3.8.1-2017	4	4	3	3	4	4

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AGRICULTURAL SOIL ANALYSIS REPORT

24 samples supplied by SLR Consulting Australia Pty Ltd on 10/06/2021. Lab Job No.K7940
Analysis requested by Alex Koeman. Your Job: PO ù 620.30245.00120
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
	Sample ID:	HA02_50-60	HA02_90-100	HA03_0-10	HA03_20-30	HA03_50-60	HA03_90-100
	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	K7940/7	K7940/8	K7940/9	K7940/10	K7940/11	K7940/12

Notes:

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			Sample 13	Sample 14	Sample 15	Sample 16	Sample 17	Sample 18
		Sample ID:	HA04_0-10	HA04_20-30	HA04_50-60	HA04_90-100	HA05_0-10	HA05_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	K7940/13	K7940/14	K7940/15	K7940/16	K7940/17	K7940/18
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	3.0	1.6	1.6	1.4	2.1	2.5
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.76	7.31	7.39	7.53	7.24	7.25
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.242	0.086	0.108	0.234	0.139	0.229
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	2.9	2.0	1.7	2.0	3.8	4.0
	Exchangeable Calcium	(cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	19	19	15	16	33	30
		(kg/ha)		8,370	8,469	6,578	7,168	14,979	13,439
		(mg/kg)		3,737	3,781	2,937	3,200	6,687	6,000
	Exchangeable Magnesium	(cmol+/kg)		7.9	7.8	9.2	12	7.7	10
		(kg/ha)		2,158	2,131	2,495	3,266	2,107	2,728
		(mg/kg)		963	951	1,114	1,458	941	1,218
	Exchangeable Potassium	(cmol+/kg)		0.65	0.77	0.52	0.51	0.85	0.87
		(kg/ha)		565	677	457	446	740	760
		(mg/kg)		252	302	204	199	331	339
	Exchangeable Sodium	(cmol+/kg)		0.66	1.6	3.1	3.6	0.69	2.0
		(kg/ha)		341	841	1,620	1,835	356	1,045
		(mg/kg)		152	375	723	819	159	467
	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)	28	29	27	32	43	43
	Calcium (%)		**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	67	65	53	50	78	70
	Magnesium (%)			28	27	33	37	18	23
	Potassium (%)			2.3	2.7	1.9	1.6	2.0	2.0
	Sodium - ESP (%)			2.4	5.6	11	11	1.6	4.7
	Aluminium (%)			0.01	0.00	0.00	0.01	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)	2.4	2.4	1.6	1.3	4.3	3.0
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	1.7	1.1	0.99	1.2	2.2	2.3
	Total Nitrogen (%)			0.10	0.06	0.05	0.05	0.10	0.10
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	18	18	19	25	21	22
	Basic Texture		**Inhouse S65	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay	Clay
	Basic Colour			Brownish	Brownish	Brownish	Brownish	Brownish	Brownish
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	155	55	69	150	89	147
	Emerson Aggregate Test (EAT)		**AS1289.3.8.1-2017	4	3	3	3	4	4

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AGRICULTURAL SOIL ANALYSIS REPORT

24 samples supplied by SLR Consulting Australia Pty Ltd on 10/06/2021. Lab Job No.K7940
Analysis requested by Alex Koeman. Your Job: PO ù 620.30245.00120
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 13	Sample 14	Sample 15	Sample 16	Sample 17	Sample 18
Sample ID:		HA04_0-10	HA04_20-30	HA04_50-60	HA04_90-100	HA05_0-10	HA05_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	K7940/13	K7940/14	K7940/15	K7940/16	K7940/17	K7940/18

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 re
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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17. This report was issued on 21/06/2021.

Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

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Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Sample 19	Sample 20	Sample 21	Sample 22	Sample 23	Sample 24
		Sample ID:	HA05_50-60	HA05_90-100	HA06_0-10	HA06_20-30	HA06_50-60	HA06_90-100
		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	K7940/19	K7940/20	K7940/21	K7940/22	K7940/23	K7940/24
	Phosphorus (mg/kg P)		**Rayment & Lyons 2011 - 9E2 (Bray 1)	1.8	2.1	2.8	1.6	1.5	1.6
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.08	6.99	7.37	7.28	7.20	7.02
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.704	1.084	0.179	0.628	0.907	1.374
	Estimated Organic Matter (% OM)		**Calculation: Total Carbon x 1.75	3.2	3.1	2.0	2.1	1.8	1.1
	Exchangeable Calcium	(cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	27	23	24	20	18	18
		(kg/ha)		11,915	10,414	10,943	8,829	8,156	8,295
		(mg/kg)		5,319	4,649	4,885	3,942	3,641	3,703
	Exchangeable Magnesium	(cmol+/kg)		14	16	7.4	11	11	12
		(kg/ha)		3,767	4,304	2,005	2,890	3,116	3,386
		(mg/kg)		1,682	1,921	895	1,290	1,391	1,512
	Exchangeable Potassium	(cmol+/kg)		0.82	0.85	0.45	0.32	0.33	0.42
		(kg/ha)		720	744	395	283	292	364
		(mg/kg)		321	332	176	126	131	163
	Exchangeable Sodium	(cmol+/kg)		6.0	7.4	1.2	5.5	7.8	9.4
		(kg/ha)		3,067	3,810	617	2,836	4,001	4,821
		(mg/kg)		1,369	1,701	275	1,266	1,786	2,152
	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	47	33	36	38	41
	Calcium (%)		**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	56	49	73	54	48	45
	Magnesium (%)			29	33	22	29	30	31
	Potassium (%)			1.7	1.8	1.4	0.89	0.89	1.0
	Sodium - ESP (%)			13	16	3.6	15	21	23
	Aluminium (%)			0.00	0.00	0.01	0.01	0.00	0.01
	Hydrogen (%)			0.00	0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol+/kg)	1.9	1.5	3.3	1.9	1.6	1.5
	Total Carbon (%)		Inhouse S4a (LECO Trumac Analyser)	1.8	1.8	1.2	1.2	1.0	0.64
	Total Nitrogen (%)			0.08	0.07	0.06	0.04	0.04	0.03
	Carbon/Nitrogen Ratio		**Calculation: Total Carbon/Total Nitrogen	22	24	19	33	28	23
	Basic Texture		**Inhouse S65	Clay	Clay	Clay	Clay	Clay	Clay
	Basic Colour			Brownish	Brownish	Brownish	Brownish	Brownish	Brownish
	Chloride Estimate (equiv. mg/kg)		**Calculation: Electrical Conductivity x 640	451	694	115	402	580	880
	Emerson Aggregate Test (EAT)		**AS1289.3.8.1-2017	4	4	4	4	4	3

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Analysis requested by Alex Koeman. Your Job: PO ù 620.30245.00120
Level 2, 15 Astor Terrace BRISBANE QLD 4000

		Sample 19	Sample 20	Sample 21	Sample 22	Sample 23	Sample 24
	Sample ID:	HA05_50-60	HA05_90-100	HA06_0-10	HA06_20-30	HA06_50-60	HA06_90-100
	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	K7940/19	K7940/20	K7940/21	K7940/22	K7940/23	K7940/24

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
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Agricultural Co-Ordinator KS

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Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Heavy Soil	Medium Soil	Light Soil	Sandy Soil
		Sample ID:				
		Crop:				
		Client:	Clay	Clay Loam	Loam	Loamy Sand
	Parameter	Method reference	Indicative guidelines - refer to Notes 6 and 8			
	Phosphorus (mg/kg P)	**Rayment & Lyons 2011 - 9E2 (Bray 1)	45 note 8	30 note 8	24 note 8	20 note 8
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.5	6.5	6.3	6.3
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.200	0.150	0.120	0.100
	Estimated Organic Matter (% OM)	**Calculation: Total Carbon x 1.75	> 5.5	>4 .5	> 3.5	> 2.5
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	15.6	10.8	5.0	1.9
	Exchangeable Calcium (kg/ha)		7000	4816	2240	840
	Exchangeable Calcium (mg/kg)		3125	2150	1000	375
	Exchangeable Magnesium (cmol+/kg)		2.4	1.7	1.2	0.60
	Exchangeable Magnesium (kg/ha)		650	448	325	168
	Exchangeable Magnesium (mg/kg)		290	200	145	75
	Exchangeable Potassium (cmol+/kg)		0.60	0.50	0.40	0.30
	Exchangeable Potassium (kg/ha)		526	426	336	224
	Exchangeable Potassium (mg/kg)		235	190	150	100
	Exchangeable Sodium (cmol+/kg)		0.3	0.26	0.22	0.11
	Exchangeable Sodium (kg/ha)		155	134	113	57
	Exchangeable Sodium (mg/kg)		69	60	51	25
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	0.6	0.5	0.4	0.2
	Exchangeable Aluminium (kg/ha)		121	101	73	30
	Exchangeable Aluminium (mg/kg)		54	45	32	14
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	0.6	0.5	0.4	0.2
	Exchangeable Hydrogen (kg/ha)		13	11	8	3
	Exchangeable Hydrogen (mg/kg)		6	5	4	2
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	20.1	14.3	7.8	3.3
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	77.6	75.7	65.6	57.4
	Magnesium (%)		11.9	11.9	15.7	18.1
	Potassium (%)		3.0	3.5	5.2	9.1
	Sodium - ESP (%)		1.5	1.8	2.9	3.3
	Aluminium (%)		6.0	7.1	10.5	12.1
	Hydrogen (%)					
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	6.5	6.4	4.2	3.2
	Total Carbon (%)	Inhouse S4a (LECO Trumac Analyser)	> 3.1	> 2.6	> 2.0	> 1.4
	Total Nitrogen (%)		> 0.30	> 0.25	> 0.20	> 0.15
	Carbon/Nitrogen Ratio	**Calculation: Total Carbon/Total Nitrogen	10–12	10–12	10–12	10–12
	Basic Texture	**Inhouse S65	..	..	..	..
	Basic Colour		..	..	..	..
	Chloride Estimate (equiv. mg/kg)	**Calculation: Electrical Conductivity x 640	..	..	..	..
	Emerson Aggregate Test (EAT)	**AS1289.3.8.1-2017	Class 3–8			

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Analysis requested by Alex Koeman. Your Job: PO ú 620.30245.00120
Level 2, 15 Astor Terrace BRISBANE QLD 4000

			Heavy Soil	Medium Soil	Light Soil	Sandy Soil
		Sample ID:				
		Crop:				
		Client:	Clay	Clay Loam	Loam	Loamy Sand
	Parameter	Method reference	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.
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Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

GRAIN SIZE ANALYSIS (hydrometer and sieving techniques)

24 soil samples supplied by SLR Consulting on 10 June, 2021 - Lab Job No. K7940
Analysis requested by Alex Koeman. Your project: PO -620.30245.00120
Level 2, 15 Astor Terrace, BRISBANE QLD 4000

SAMPLE ID	Lab Code	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)
HA01_0-10	K7940/1	12.4%	1.1%	0.0%	1.1%	12.5%	21.8%	15.4%	49.2%	100.0%
HA01_20-30	K7940/2	12.2%	3.5%	0.0%	3.5%	11.9%	18.5%	17.8%	48.4%	100.0%
HA01_50-60	K7940/3	12.9%	3.4%	0.0%	3.4%	11.0%	16.1%	14.3%	55.2%	100.0%
HA01_90-100	K7940/4	14.5%	2.3%	0.0%	2.3%	9.1%	18.7%	12.5%	57.5%	100.0%
HA02_0-10	K7940/5	9.2%	2.1%	0.0%	2.1%	10.5%	22.8%	17.0%	47.5%	100.0%
HA02_20-30	K7940/6	10.4%	2.0%	0.0%	2.0%	11.4%	20.8%	15.6%	50.2%	100.0%
HA02_50-60	K7940/7	12.3%	0.8%	0.0%	0.8%	8.0%	21.1%	19.5%	50.6%	100.0%
HA02_90-100	K7940/8	12.8%	1.7%	0.0%	1.7%	4.7%	16.3%	24.1%	53.3%	100.0%
HA03_0-10	K7940/9	4.0%	2.9%	0.0%	2.9%	27.5%	32.1%	13.0%	24.5%	100.0%
HA03_20-30	K7940/10	11.6%	0.2%	0.0%	0.2%	15.9%	19.3%	6.9%	57.7%	100.0%
HA03_50-60	K7940/11	9.8%	1.8%	0.0%	1.8%	18.3%	22.0%	10.0%	47.9%	100.0%
HA03_90-100	K7940/12	9.3%	0.5%	0.0%	0.5%	20.8%	23.6%	11.6%	43.5%	100.0%
HA04_0-10	K7940/13	6.4%	0.0%	0.0%	0.0%	12.6%	21.6%	15.6%	50.2%	100.0%
HA04_20-30	K7940/14	8.1%	0.6%	0.0%	0.6%	14.5%	23.6%	12.9%	48.4%	100.0%
HA04_50-60	K7940/15	9.2%	11.0%	0.0%	11.0%	24.2%	13.9%	10.0%	40.9%	100.0%
HA04_90-100	K7940/16	9.1%	6.2%	0.0%	6.2%	18.3%	12.7%	14.2%	48.5%	100.0%
HA05_0-10	K7940/17	11.9%	4.8%	0.0%	4.8%	9.1%	13.0%	17.7%	55.5%	100.0%
HA05_20-30	K7940/18	13.9%	2.6%	0.0%	2.6%	8.8%	1.1%	20.6%	66.9%	100.0%
HA05_50-60	K7940/19	15.5%	1.1%	0.0%	1.1%	6.5%	19.1%	13.8%	59.6%	100.0%
HA05_90-100	K7940/20	15.5%	1.6%	0.0%	1.6%	6.1%	13.2%	17.3%	61.8%	100.0%
HA06_0-10	K7940/21	9.0%	0.5%	0.0%	0.5%	16.2%	22.7%	14.7%	45.9%	100.0%
HA06_20-30	K7940/22	11.8%	3.5%	0.0%	3.5%	15.4%	21.2%	14.5%	45.4%	100.0%
HA06_50-60	K7940/23	12.7%	4.0%	0.0%	4.0%	15.3%	19.0%	13.9%	47.8%	100.0%
HA06_90-100	K7940/24	13.9%	0.1%	0.0%	0.1%	14.1%	20.2%	14.4%	51.1%	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 1/07/2021

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

GRAIN SIZE ANALYSIS (hydrometer and sieving techniques)

13 soil samples supplied by SLR Consulting Australia Pty Ltd on 3rd January, 2024 - Lab Job No. P9147
Analysis requested by Alex Koeman. Job ref: 620.31354.00000
Level 2, 15 Astor Terrance BRISBANE QLD 4000

SAMPLE ID	Lab Code	MOISTURE CONTENT (% of water in sample)	TOTAL GRAVEL > 2 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 (% of total oven-dry equivalent)	CLAY < 2 µm (% of total oven-dry equivalent)
HA08 0.00 - 0.10	P9147/1	7.6%	0.1%	9.8%	33.8%	21.2%	35.2%
HA08 0.20 - 0.30	P9147/2	9.2%	0.4%	7.6%	30.2%	14.1%	47.7%
HA08 0.50 - 0.60	P9147/3	12.2%	0.3%	6.4%	27.0%	14.2%	52.2%
HA08 0.90 - 1.00	P9147/4	11.3%	0.4%	7.0%	18.9%	18.8%	54.9%
HA09 0.00 - 0.10	P9147/5	1.8%	0.0%	39.4%	46.3%	3.8%	10.5%
HA09 0.20 - 0.30	P9147/6	3.5%	0.0%	37.2%	49.9%	2.7%	10.2%
HA09 0.50 - 0.60	P9147/7	3.9%	0.1%	26.8%	59.9%	2.8%	10.3%
HA09 0.90 - 1.00	P9147/8	4.4%	0.4%	25.9%	53.9%	5.8%	14.1%
HA13 0.00 - 0.10	P9147/9	2.3%	0.0%	63.7%	28.5%	1.1%	6.7%
HA13 0.20 - 0.30	P9147/10	1.6%	0.0%	64.1%	30.1%	0.5%	5.3%
HA13 0.5 - 0.60	P9147/11	2.2%	0.2%	66.0%	27.8%	0.5%	5.4%
HA13 0.70 - 0.80	P9147/12	3.1%	0.1%	71.7%	24.3%	0.9%	2.9%
HA13 0.90 - 1.00	P9147/13	2.3%	0.2%	71.2%	22.8%	0.7%	5.1%

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),
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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 15/1/2024.

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Appendix D Detailed Profile Descriptions

Soil and Land Resource Assessment Report

Whitehaven Daunia Pty Ltd

SLR Project No.: 620.042120.00001

24 May 2026

Soil Map Unit 1 – Epipedal Black-Brown Vertosol

Table 1 – Summary Epipedal Black Vertosol (HA01)

Overview	
Landscape 	
ASC Name	Epipedal Black Vertosol
Representative Site	HA01
Other Mapped Sites	HA02, HA14
Coordinates: Zone, Easting/Northing	Zone 55K, 633 313, 7 555 883
Survey Type	Detailed lab analysed
Landform Element	Plain
Landform Pattern	Covered plain
Morphology Type & Relief Modal Slope	Mid-slope, gently undulating plain
Dominant Land Use	Grazing
Microrelief	Nil
Surface Coarse Fragments and Outcrop	Nil
Permeability and Drainage	Slowly, imperfectly drained
Surface Condition	Cracking
Vegetation	Brigalow
Slope (%) and Slope Type	1-3%; Very gently inclined

Table 2 – Soil Profile: Epipedal Black Vertosol (HA01)

Profile	Horizon / Depth (m)	Description
	A1 0.00 – 0.20	Very dark brown (10YR 2/2) medium clay, dry, strong structure of 10-20 mm in size, angular blocky peds with a rough fabric and strong consistence. Nil mottling and nil coarse fragments. Calcareous concretions which are 2-6 mm in size. Gradual boundary. Sampled 0.00 – 0.10 m.
	B21 0.20 – 0.45	Very dark brown (10YR 2/2) medium clay, dry, strong structure of 10-20 mm in size, angular blocky peds with a rough fabric and strong consistence. Nil mottling and nil coarse fragments. Calcareous concretions which are 2-6 mm in size. Gradual boundary. Sampled 0.20 – 0.30 m.
	B22 0.45 – 1.00	Black (10YR 2/1) heavy clay, moderately moist, strong structure of 20-50 mm angular blocky peds with a rough fabric and very firm consistence. Nil mottling and nil coarse fragments. Calcareous concretions which are 2-6 mm in size. Sampled 0.50 – 0.60 m and 0.90 – 1.00 m. Layer continues beyond sampling depth.

Table 3 – Field Chemical Parameters: Epipedal Black Vertosol (HA01)

Layer	Field pH	Description	Field Dispersion	Field Effervescence
A1	7.0	Neutral	Nil	Strong
B21	7.5	Mildly alkaline	Nil	Strong
B22	7.5	Mildly Alkaline	Moderate	Strong

Table 4 – Chemical Parameters: Epipedal Black Vertosol (HA01)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.9	Neutral	1.9	Non-sodic	1.3	Non-saline	4.6	Balanced
B21	7.1	Neutral	2.6	Non-sodic	1.4	Non-saline	4.2	Balanced
B22	7.2	Neutral	10.7	Sodic	2.8	Slightly saline	2.3	Ca-low
	7.1	Neutral	14.9	Strongly sodic	4.6	Moderately saline	1.9	Ca-low

Table 5 – Summary Epipedal Black Vertosol (HA02)

Overview	
Landscape 	
ASC Name	Epipedal Black Vertosol
Representative Site	HA02
Other Mapped Sites	HA01, HA14
Coordinates: Zone, Easting/Northing	Zone 55K, 633 690, 7 555 982
Survey Type	Detailed lab analysed
Landform Element	Plain
Landform Pattern	Covered plain
Morphology Type & Relief Modal Slope	Upper slope, gently undulating plain
Dominant Land Use	Grazing
Microrelief	Nil
Surface Coarse Fragments and Outcrop	Nil
Permeability and Drainage	Slowly, imperfectly drained
Surface Condition	Cracking
Vegetation	Brigalow
Slope (%) and Slope Type	1-3%; Very gently inclined

Table 6 – Profile: Epipedal Black Vertosol (HA02)

Profile	Horizon / Depth (m)	Description
	A1 0.00 – 0.50	Very dark greyish brown (10YR 3/2) medium clay, dry, strong structure of 5-10 mm angular blocky peds with a rough fabric and strong consistence. Nil mottling and nil coarse fragments. Calcareous nodules which are 2-6 mm in size. Gradual boundary. Sampled 0.00 – 0.10 m and 0.20 – 0.30 m.
	B21 0. 50 – 1.00	Dark greyish brown (10YR 4/2) heavy clay becoming silty clay with depth, moderately moist, strong structure of 5-10 mm subangular blocky peds with a rough fabric and very firm consistence. Mottling which is 10-20% abundance, faint, orange. Nil coarse fragments and segregations. Sampled 0.50 – 0.60 m and 0.90 – 1.00 m. Layer continues beyond sampling depth.

Table 7 – Field Chemical Parameters: Epipedal Black Vertosol (HA02)

Layer	Field pH	Description	Field Dispersion	Field Effervescence
A1	7.5	Mildly alkaline	Nil	Strong
B21	7.5	Mildly alkaline	Moderate	Moderate

Table 8 – Chemical Parameters: Epipedal Black Vertosol (HA02)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.2	Neutral	2.0	Non-sodic	1.3	Non-saline	4.3	Balanced
	7.3	Neutral	3.7	Non-sodic	1.5	Non-saline	3.3	Ca-low
B21	7.2	Neutral	11.9	Sodic	3.5	Slightly saline	1.9	Ca-low
	6.9	Neutral	17.9	Strongly sodic	10.7	Highly saline	1.5	Ca-low

Table 9 – Summary Epipedal Brown Vertosol (HA14)

Overview	
Landscape 	
ASC Name	Epipedal Brown Vertosol
Representative Site	HA14
Other Mapped Sites	HA01 and HA02
Coordinates: Zone, Easting/Northing	Zone 55K, 632 259, 7 556 737
Survey Type	Detailed
Landform Element	Hillslope
Landform Pattern	Rises
Morphology Type& Relief Modal Slope	Upper slope; undulating rises
Dominant Land Use	Grazing
Microrelief	Nil
Surface Coarse Fragments and Outcrop	2-10% subangular 6-20 mm igneous fragments. Nil outcrop
Permeability and Drainage	Slowly, imperfectly drained
Surface Condition	Cracking
Vegetation	Grasses and juvenile trees
Slope (%) and Slope Type	8%, Gently inclined

Table 10 – Profile: Epipedal Brown Vertosol (HA14)

Profile	Horizon / Depth (m)	Description
	A1 0.00 – 0.20	Brown (10YR 3/2) medium clay, strong structure of 10-20 mm subangular blocky peds with a strong consistence. Nil mottling, nil coarse fragments, and nil segregations. Gradual boundary. Nil cutans and pans. Sampled 0.00 – 0.10 m.
	B21 0.20 – 0.70	Dark brown (7.5YR 3/3) medium heavy clay, strong structure of 5-10 mm subangular blocky peds with a very strong consistence. Mottles which are 2-10% in abundance and <5 mm in size, faint grey. Nil coarse fragments, and nil segregations. Gradual boundary. Nil cutans and pans. Sampled 0.20 – 0.30 m and sampled 0.50 – 0.60 m.
	B22 0.70 – 1.00	Dark brown (7.5YR 3/4) medium heavy clay, strong structure of 2-5 mm subangular blocky peds with a very strong consistence. Mottles which are 10-20% in abundance and 5-15 mm in size, faint grey and red. Nil coarse fragments, and nil segregations. Nil cutans and pans. Sampled 0.90 – 1.00 m. Layer continues beyond sampling depth.

Table 11 – Field Chemical Parameters: Epipedal Brown Vertosol (HA14)

Layer	Field pH	Description	Field Dispersion	Field Effervescence
A1	7.5	Mildly alkaline	Nil	Nil
B21	7.5	Mildly alkaline	Moderate	Moderate
B22	7.0	Neutral	Moderate	Moderate

Soil Map Unit 1 – Sub-Dominant Soil Type

Table 12 – Summary Sodic Eutrophic Black Chromosol (HA03)

Overview	
Landscape 	
ASC Name	Sodic Eutrophic Black Chromosol
Representative Site	HA03
Other Mapped Sites	Nil
Coordinates: Zone, Easting/Northing	Zone 55K, 633 812, 7 554 101
Survey Type	Detailed lab analysed
Landform Element	Plain
Landform Pattern	Covered plain
Morphology Type & Relief Modal Slope	Flat, level plain
Dominant Land Use	Grazing
Microrelief	Nil
Surface Coarse Fragments and Outcrop	Nil
Permeability and Drainage	Moderately, imperfectly drained
Surface Condition	Loose
Vegetation	Brigalow
Slope (%) and Slope Type	<1%; Level

Table 13 – Profile: Sodic Eutrophic Black Chromosol (HA03)

Profile	Horizon / Depth (m)	Description
No photograph available	A1 0.00 – 0.10	Very dark greyish brown (10YR 3/2) clay loam, dry, weak structure of 2-5 mm in size, angular blocky peds with a rough fabric and strong consistence. Nil mottling and nil coarse fragments. Calcareous nodules which are 2-6 mm in size. Abrupt and even boundary. Sampled 0.00 – 0.10 m.
	B21 0.10 – 0.30	Very dark greyish brown (10YR 3/2) heavy clay, dry, strong structure of 2-5 mm in size, angular blocky peds with a rough fabric and strong consistence. Nil mottling and nil coarse fragments. Calcareous nodules which are 2-6 mm in size. Gradual boundary. Sampled 0.20 – 0.30 m.
	B22 0.30 – 1.00	Dark greyish brown (10YR 4/2), medium clay becoming light-medium clay with depth, moderately moist, strong structure of 5-10 mm in size, subangular blocky peds with a rough fabric and very firm consistence. 10-20% abundance, faint orange mottling. Nil coarse fragments and segregations. Sampled 0.50 – 0.60 m and 0.90 – 1.00 m. Later continues beyond sampling depth.

Table 14 – Field Chemical Parameters: Sodic Eutrophic Black Chromosol (HA03)

Layer	Field pH	Description	Field Dispersion	Field Effervescence
A1	7.0	Neutral	Nil	Strong
B21	7.0	Neutral	Nil	Strong
B22	7.5	Mildly alkaline	Moderate	Moderate

Table 15 – Chemical Parameters: Sodic Eutrophic Black Chromosol (HA03)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.7	Neutral	1.4	Non-Sodic	0.3	Non-saline	2.5	Ca-low
B21	7.0	Neutral	5.8	Non-Sodic	0.9	Non-saline	1.3	Ca-low
B22	7.2	Neutral	9.1	Marginally sodic	2.7	Slightly saline	1.4	Ca-low
	7.2	Neutral	12.5	Sodic	5.0	Moderately saline	1.5	Ca-low

Soil Map Unit 2 – Palic Brown Arenosol

Table 16 – Summary Palic Brown Arenosol (HA13)

Overview	
Landscape 	
ASC Name	Palic Brown Arenosol
Representative Site	HA13
Other Mapped Sites	Nil
Coordinates: Zone, Easting/Northing	Zone 55K, 632 837, 7 554 499
Survey Type	Detailed lab analysed
Landform Element	Plain
Landform Pattern	Covered plain
Morphology Type & Relief Modal Slope	Flat, level plain
Dominant Land Use	Grazing
Microrelief	Nil
Surface Coarse Fragments and Outcrop	Nil
Permeability and Drainage	Rapidly, well drained
Surface Condition	Loose
Vegetation	Gum trees, ironbark, grasses and weeds
Slope (%) and Slope Type	<1%; Level

Table 17 – Profile: Palic Brown Arenosol (HA13)

Profile	Horizon / Depth (m)	Description
	A11 0.00 – 0.15	Yellowish brown (10YR4/4). sand, dry, single grained structure. Nil mottling, nil coarse fragments, and nil segregations. Clear boundary. Nil cutans and pans. Sampled 0.00 – 0.10 m.
	A12 0.15 – 0.35	Dark yellowish brown (10YR4/6). sand, dry, single grained structure. Nil mottling, nil coarse fragments, and nil segregations. Clear boundary. Nil cutans and pans. Sampled 0.10 – 0.20 m.
	B21 0.35 – 0.60	Strong brown (7.5YYR 5/6) sand, dry, single grained structure. Nil mottling, nil coarse fragments, and nil segregations. Gradual boundary. Nil cutans and pans. Sampled 0.50 – 0.60 m
	B22 0.60 – 0.85	Yellowish red (5YR 4/6) sand, moderately moist, single grained structure. Nil mottling, nil coarse fragments, and nil segregations. Gradual boundary. Nil cutans and pans. Sampled 0.70 – 0.80 m.
	B23 0.85 – 1.00	Reddish brown (2.5YR 4/4) sand, moderately moist, single grained structure. Nil mottling, nil coarse fragments, and nil segregations. Nil cutans and pans. Sampled 0.90 – 1.00 m. Later continues beyond sampling depth.

Table 18 – Field Chemical Parameters: Palic Brown Arenosol (HA13)

Layer	Field pH	Description	Field Dispersion	Field Effervescence
A1	6.5	Slightly acidic	Nil	Nil
A12	7.0	Neutral	Nil	Nil
B21	7.5	Mildly alkaline	Nil	Nil
B22	7.5	Mildly alkaline	Nil	Nil
B23	7.5	Mildly alkaline	Nil	Nil

Table 19 – Chemical Parameters: Palic Brown Arenosol (HA13)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A11	6.8	Neutral	0.2	Non-sodic	0.1	Non-saline	3.4	Ca-low
A12	7.3	Neutral	0.2	Non-sodic	2.0	Slightly saline	3.4	Ca-low
B21	7.6	Mildly alkaline	1.1	Non-sodic	0.5	Non-saline	3.5	Ca-low
B22	7.7	Mildly alkaline	0.5	Non-sodic	0.4	Non-saline	3.0	Ca-low
B23	7.7	Mildly alkaline	0.5	Non-sodic	0.3	Non-saline	2.8	Ca-low

Appendix E Check Site Descriptions

Soil and Land Resource Assessment Report

Whitehaven Daunia Pty Ltd

SLR Project No.: 620.042120.00001

24 May 2026

Soil Map Unit 1 – Epipedal Black-Brown Vertosol

Table 1 Summary: Black Vertosol (Check Site 01)

Overview		
ASC Name	Black Vertosol	
Representative Site	C01	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	632 670 7 556 555	
Landform Element	Plain	
Landform Pattern	Covered plain	
Morphology Type and Relief Modal Slope	Upper slope, level plain	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Surface Condition	Cracking	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	Nil	
Slope (%) and Slope Type	<1%; Level	

Profile	Description
	Very dark greyish brown (10YR 3/2), light clay, strong structure, angular blocky peds.

Table 2 Summary: Black Vertosol (Check Site 02)

Overview		
ASC Name	Black Vertosol	
Representative Site	C02	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	632 771 7 556 150	
Landform Element	Bank (stream)	
Landform Pattern	Covered plain	
Morphology Type and Relief Modal Slope	Open depression	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Surface Condition	Cracking	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	Nil	
Slope (%) and Slope Type	<1%; Level	

Profile	Description
	A1 (0.00 – 0.10 m) Very dark greyish brown (10YR 3/2), light clay, strong structure, angular blocky peds.

Table 3 Summary: Black Vertosol (Check Site 03)

Overview		
ASC Name	Black Vertosol	
Representative Site	C03	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	632 939 7 556 400	
Landform Element	Plain	
Landform Pattern	Covered plain	
Morphology Type and Relief Modal Slope	Upper slope; Level plain	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Surface Condition	Cracking	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	Nil	
Slope (%) and Slope Type	<1%; Level	

Profile	Description
	Very dark greyish brown (10YR 3/2), medium clay, strong structure, angular blocky peds.

Table 4 Summary: Brown Vertosol (Check Site 04)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C04	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	632 858 7 555 715	
Landform Element	Bank (stream)	
Landform Pattern	Covered plain	
Morphology Type and Relief Modal Slope	Open depression; Level plain	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Surface Condition	Cracking	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	Nil, metamorphic outcrop.	
Slope (%) and Slope Type	<1%; Level	

Profile	Description
	A1 (0.00 – 0.10 m) Yellowish brown (10YR 5/4), light clay, strong structure, angular blocky peds.

Table 5 Summary: Black Vertosol (Check Site 05)

Overview		
ASC Name	Black Vertosol	
Representative Site	C05	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	633 991 7 555 434	
Landform Element	Plain	
Landform Pattern	Covered plain	
Morphology Type and Relief Modal Slope	Upper slope; level plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Surface Condition	Cracking	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	<2% 5-10 mm, metamorphic outcrop.	
Slope (%) and Slope Type	<1%; Level	

Profile	Description
	Black (10YR 2/1), medium clay, strong structure, angular blocky peds.

Table 6 Summary: Black Vertosol (Check Site 06)

Overview		
ASC Name	Black Vertosol	
Representative Site	C06	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	633 148 7 555 190	
Landform Element	Plain	
Landform Pattern	Chenier plain	
Morphology Type and Relief Modal Slope	Flat; Level plain	
Dominant Land Use	Grazing	
Vegetation	Eucalyptus	
Surface Condition	Cracking	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	Nil	
Slope (%) and Slope Type	<1%; Level	

Profile	Description
	Black (10YR 2/1), light clay, strong structure, sub-angular blocky peds.

Table 7 Summary: Black Vertosol (Check Site 07)

Overview		
ASC Name	Black Vertosol	
Representative Site	C07	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	632 632 7 555 071	
Landform Element	Plain	
Landform Pattern	Covered plain	
Morphology Type and Relief Modal Slope	Flat, Level plain	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Surface Condition	Firm	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	Nil	
Slope (%) and Slope Type	<1%, Level	

Profile	Description
	Black (10YR 2/1) light clay, strong structure, sub-angular blocky peds.

Table 8 Summary: Black Vertosol (Check Site 12)

Overview		
ASC Name	Black Vertosol	
Representative Site	C12	
Soil Profile Class	SPC 1	
Survey Type	Check site	
Coordinates: Zone, Easting/Northing (GDA2020 Z55)	634 210 7 554 677	
Landform Element	Plain	
Landform Pattern	Covered plain	
Morphology Type and Relief Modal Slope	Flat; Level plain	
Dominant Land Use	Grazing	
Vegetation	Brigalow	
Surface Condition	Firm	
Microrelief	Nil	
Permeability and Drainage	Slowly, imperfectly drained	
Surface Coarse Fragments and Outcrop	Nil	
Slope (%) and Slope Type	<1%; Level plain	

Profile	Description
	Very dark greyish brown (10YR 3/2), light medium clay, strong structure, angular blocky peds.

Appendix F Land Suitability Framework for the Inland Fitzroy and Southern Burdekin area

Soil and Land Resource Assessment Report

Whitehaven Daunia Pty Ltd

SLR Project No.: 620.042120.00001

24 May 2026

10 Suitability framework for the Inland Fitzroy and Southern Burdekin area

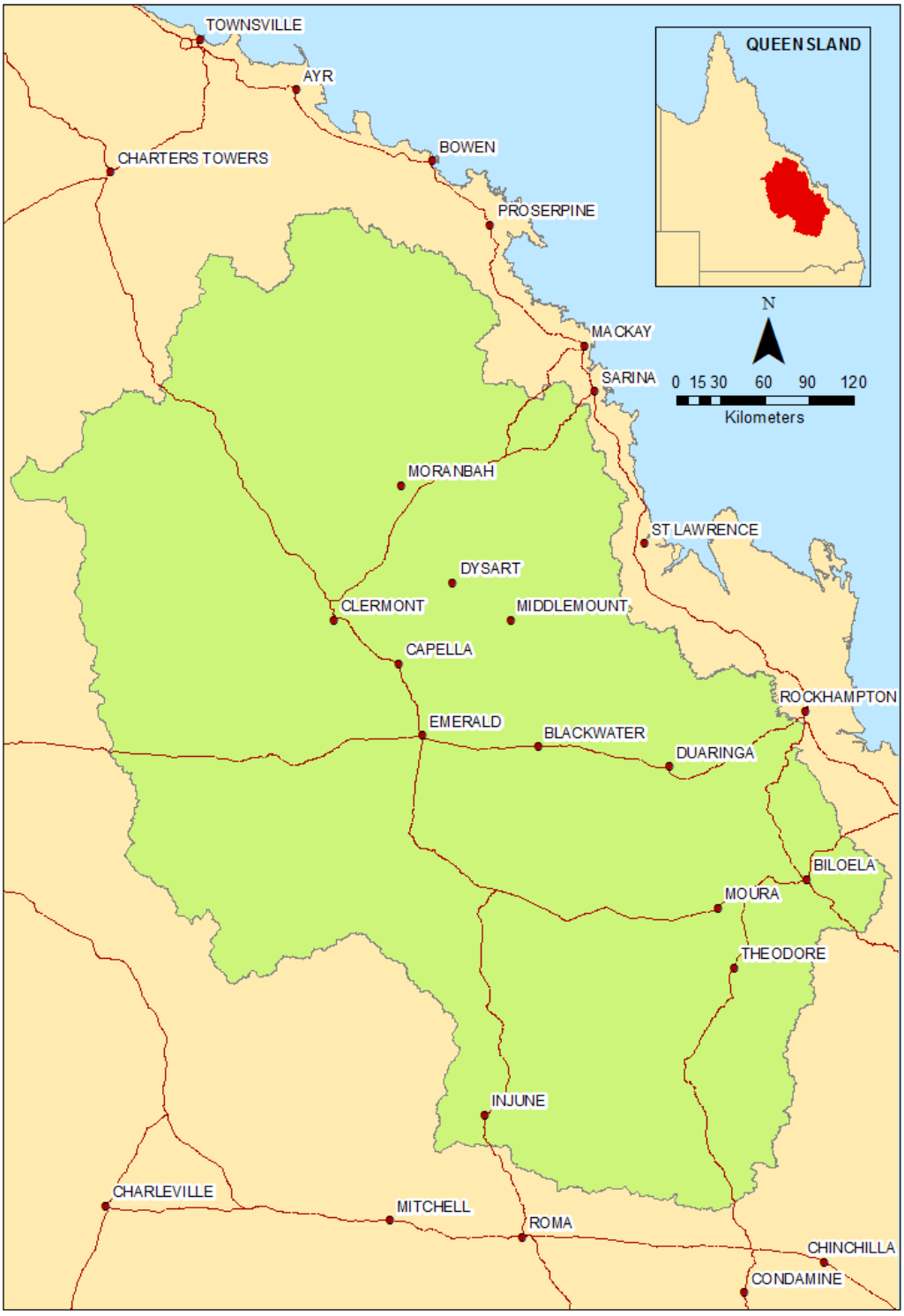


Figure 9. Area covered by the Inland Fitzroy and Southern Burdekin suitability framework

E - Water erosion

Limitation		Suitability subclasses for various land management options
Value	**Description**	**Group A**
11	Slopes of 0-0.5% with non dispersive moderate to strongly coherent soil in the surface 200mm	1
12	Slopes of 0-0.5% with non dispersive weakly coherent soil in the surface 200mm	1
13	Slopes of 0-0.5% with dispersive soil in the surface 200mm	3
21	Slopes of 0.5-1% with non dispersive moderate to strongly coherent soil in the surface 200mm	1
22	Slopes of 0.5-1% with non dispersive weakly coherent soil in the surface 200mm	2
23	Slopes of 0.5-1% with dispersive soil in the surface 200mm	4
31	Slopes of 1-3% with non dispersive moderate to strongly coherent soil in the surface 200mm	2
32	Slopes of 1-3% with non dispersive weakly coherent soil in the surface 200mm	3
33	Slopes of 1-3% with dispersive soil in the surface 200mm	5
41	Slopes of 3-5% with non dispersive moderate to strongly coherent soil in the surface 200mm	3
42	Slopes of 3-5% with non dispersive weakly coherent soil in the surface 200mm	4
43	Slopes of 3-5% with dispersive soil in the surface 200mm	5
51	Slopes of 5-8% with non dispersive moderate to strongly coherent soil in the surface 200mm	3
52	Slopes of 5-8% with non dispersive weakly coherent soil in the surface 200mm	4
53	Slopes of 5-8% with dispersive soil in the surface 200mm	5
61	Slopes greater than 8% with non dispersive moderate to strongly coherent soil in the surface 200mm	5
62	Slopes greater than 8% with non dispersive weakly coherent soil in the surface 200mm	5
63	Slopes greater than 8% with dispersive soil in the surface 200mm	5

Group A
Barley-Dryland
Chickpea-Dryland
Cotton-Furrow Irrigated
Maize-Dryland
Millet-Dryland
Mungbean-Dryland
Oat-Dryland
Safflower-Dryland
Sorghum-Dryland
Soybean-Dryland
Sunflower-Dryland
Triticale-Dryland
Wheat-Dryland

Es - Erosion hazard, subsoil erodibility

Limitation		Suitability subclasses for various land management options
Value	**Description**	**Group A**
11	Slopes of 0-0.5% with no subsoil (200-1000mm) dispersion	1
12	Slopes of 0-0.5% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	1
13	Slopes of 0-0.5% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	2
21	Slopes of 0.5-1% with no subsoil (200-1000mm) dispersion	1
22	Slopes of 0.5-1% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	2
23	Slopes of 0.5-1% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	3
31	Slopes of 1-3% with no subsoil (200-1000mm) dispersion	1
32	Slopes of 1-3% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	3
33	Slopes of 1-3% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	4
41	Slopes of 3-5% with no subsoil (200-1000mm) dispersion	3
42	Slopes of 3-5% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	3
43	Slopes of 3-5% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	5
51	Slopes of 5-8% with no subsoil (200-1000mm) dispersion	3
52	Slopes of 5-8% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	4
53	Slopes of 5-8% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	5
61	Slopes greater than 8% with no subsoil (200-1000mm) dispersion	5
62	Slopes greater than 8% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	5
63	Slopes greater than 8% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	5

Group A	
Barley-Dryland	Triticale-Dryland
Chickpea-Dryland	Wheat-Dryland
Cotton-Furrow Irrigated	
Maize-Dryland	
Millet-Dryland	
Mungbean-Dryland	
Oat-Dryland	
Safflower-Dryland	
Sorghum-Dryland	
Soybean-Dryland	
Sunflower-Dryland	

M – Soil water availability

Limitation		Suitability subclasses for various land management options		
Value	Description	Group A	Group B	Group C
1	PAWC greater than 150mm/100cms	1	2	2
2	PAWC 125-150mm/100cms	2	2	3
3	PAWC 100-125mm/100cms	3	3	4
4	PAWC 75-100mm/100cms	3	4	5
5	PAWC 50-75mm/100cms	4	5	5
6	PAWC less than 50mm/100cms	5	5	5

Group A	Group B	Group C
Cotton-Furrow Irrigated	Maize-Dryland	Barley-Dryland
	Mungbean-Dryland	Chickpea-Dryland
	Safflower-Dryland	Millet-Dryland
	Sorghum-Dryland	Oat-Dryland
	Soybean-Dryland	Triticale-Dryland
	Sunflower-Dryland	Wheat-Dryland

Pm - Narrow moisture range

Limitation		Suitability subclasses for various land management options
Value	**Description**	**Group A**
1	Wide moisture range for cultivation – moderately well drained to rapidly drained; not hard setting when dry and not 'spewy' (i.e. boggy) when wet. Deep sands and thick sandy surfaced texture contrast soils	1
2	Moderate moisture range for cultivation – moderately well drained to rapidly drained; not hard setting when dry and not 'spewy' when wet. Moderately to strongly self-mulching clays	1
3	Moderate moisture range for cultivation – moderately well drained to rapidly drained; predominantly hard setting when dry and not 'spewy' when wet. Well drained earths and moderately well drained hard setting loamy surfaced soils	2
4	Moderate moisture range for cultivation (but less than Pm 3) – imperfectly drained to moderately well drained; not hard setting (or only weakly) when dry and 'spewy' when wet. Sandy surfaced (less than 0.4 m), sodic texture contrast soils	3
5	Narrow moisture range for cultivation – imperfectly drained to moderately well drained; hard setting, firm or weakly self-mulching when dry and not 'spewy' when wet. Hard setting, firm or weakly self-mulching, pedal clays	3
6	Narrow moisture range for cultivation – imperfectly drained to moderately well drained; hard setting when dry and 'spewy' when wet. Loamy surfaced (less than 0.4 m), sodic texture contrast soils or dermosols	3
7	Very narrow moisture range for cultivation – imperfectly drained to moderately well drained; very hard setting when dry and 'spewy' when wet. Very hard setting, sodic clays	4

Group A
Barley-Dryland
Chickpea-Dryland
Cotton-Furrow Irrigated
Maize-Dryland
Millet-Dryland
Mungbean-Dryland
Oat-Dryland
Safflower-Dryland
Sorghum-Dryland
Soybean-Dryland
Sunflower-Dryland
Triticale-Dryland
Wheat-Dryland

Ps - Surface condition

Limitation		Suitability subclasses for various land management options
Value	**Description**	**Group A**
1	Soils with soft or loose sandy to sandy loam surface horizons	1
2	Very fine self-mulching clays (peds less than 2mm)	1
3	Soils with soft, firm or only weakly hard setting, sandy to loamy surface horizons	2
4	Fine self-mulching clays (peds greater than 2-5mm)	2
5	Coarse self-mulching clays (peds greater than 5–10mm); poor seed soil contact due to separation of large peds with drying	3
6	Clay soils with hard setting, firm pedal or weakly self-mulching surface horizons	3
7	Very coarse self-mulching clays (peds greater than 10mm)	4
8	Loamy, fine sand, silty or clayey surface soils that are extremely hard setting, massive or crusting	4

Group A
Barley-Dryland
Chickpea-Dryland
Cotton-Furrow Irrigated
Maize-Dryland
Millet-Dryland
Mungbean-Dryland
Oat-Dryland
Safflower-Dryland
Sorghum-Dryland
Soybean-Dryland
Sunflower-Dryland
Triticale-Dryland
Wheat-Dryland

R - Rockiness

Limitation		Suitability subclasses for various land management options	
Value	**Description**	**Group A**	**Group B**
C2	Cobbles 60 to 200mm and abundance less than 10%	3	3
C3	Cobbles 60 to 200mm and abundance 10-20%	3	4
C4	Cobbles 60 to 200mm and abundance 20-50%	4	4
C5	Cobbles 60 to 200mm and abundance greater than 50%	4	4
G2	Gravels less than 20mm and abundance less than 10%	1	1
G3	Gravels less than 20mm and abundance 10-20%	2	2
G4	Gravels less than 20mm and abundance 20-50%	2	3
G5	Gravels less than 20mm and abundance greater than 50%	3	3
P2	Pebbles 20 to 60mm and abundance less than 10%	2	2
P3	Pebbles 20 to 60mm and abundance 10-20%	2	2
P4	Pebbles 20 to 60mm and abundance 20-50%	3	4
P5	Pebbles 20 to 60mm and abundance greater than 50%	4	4
S2	Stones greater than 200mm and abundance less than 10%	3	3
S3	Stones greater than 200mm and abundance 10-20%	3	4
S4	Stones greater than 200mm and abundance 20-50%	5	5
S5	Stones greater than 200mm and abundance greater than 50%	5	5

Group A	Group B
Barley-Dryland	Mungbean-Dryland
Chickpea-Dryland	Soybean-Dryland
Cotton-Furrow Irrigated	
Maize-Dryland	
Millet-Dryland	
Oat-Dryland	
Safflower-Dryland	
Sorghum-Dryland	
Sunflower-Dryland	
Triticale-Dryland	
Wheat-Dryland	

Tm - Microrelief

Limitation		Suitability subclasses for various land management options
Value	**Description**	**Group A**
1	No microrelief across the majority (greater than 70%) of the land surface	1
2	Very weakly developed microrelief (VI less than 0.1m) that occurs across much (30–70%) of the land surface	2
3	Normal, lattice or linear gilgai (VI 0.1–0.3m) that occurs across less than 30% of the land surface	2
4	Normal, lattice or linear gilgai (VI 0.1–0.3m) that occurs across much (30–70%) of the land surface	2
5	Normal, lattice or linear gilgai (VI 0.1–0.3m) across the majority (greater than 70%) of the land surface	2
6	Shallow, melonhole gilgai (VI 0.3–0.6m) that occurs across less than 30% of the land surface	2
7	Shallow, melonhole gilgai (VI 0.3–0.6m) that occurs across much (30–70%) of the land surface	3
8	Shallow, melonhole gilgai (VI 0.3–0.6m) across the majority (greater than 70%) of the land surface	4
9	Strongly developed, deep, melonhole gilgai (VI 0.6–1.5m) that occurs across less than 30% of the land surface	4
10	Strongly developed, deep, melonhole gilgai (VI 0.6–1.5m) that occurs across much (30–70%) of the land surface	5
11	Strongly developed, deep, melonhole gilgai (VI 0.6–1.5m) across the majority (greater than 70%) of the land surface	5

Group A
Barley-Dryland
Chickpea-Dryland
Cotton-Furrow Irrigated
Maize-Dryland
Millet-Dryland
Mungbean-Dryland
Oat-Dryland
Safflower-Dryland
Sorghum-Dryland
Soybean-Dryland
Sunflower-Dryland
Triticale-Dryland
Wheat-Dryland

W - Wetness

Limitation		Suitability subclasses for various land management options		
Value	**Description**	**Group A**	**Group B**	**Group C**
2	Very poorly to poorly drained	5	5	5
3H	Imperfectly drained and highly permeable	2	3	3
3M	Imperfectly drained and moderately permeable	3	3	3
3S	Imperfectly drained and slowly permeable	4	4	4
4H	Moderately well drained and highly permeable	1	1	2
4M	Moderately well drained and moderately permeable	1	1	2
4S	Moderately well drained and slowly permeable	2	2	2
5	Well drained	1	1	1
6	Rapidly drained	1	1	1

Group A	Group B	Group C
Barley-Dryland	Mungbean-Dryland	Cotton-Furrow Irrigated
Chickpea-Dryland	Safflower-Dryland	
Maize-Dryland	Soybean-Dryland	
Millet-Dryland	Sunflower-Dryland	
Oat-Dryland		
Sorghum-Dryland		
Triticale-Dryland		
Wheat-Dryland		

Appendix G Land Suitability Assessments

Soil and Land Resource Assessment Report

Whitehaven Daunia Pty Ltd

SLR Project No.: 620.042120.00001

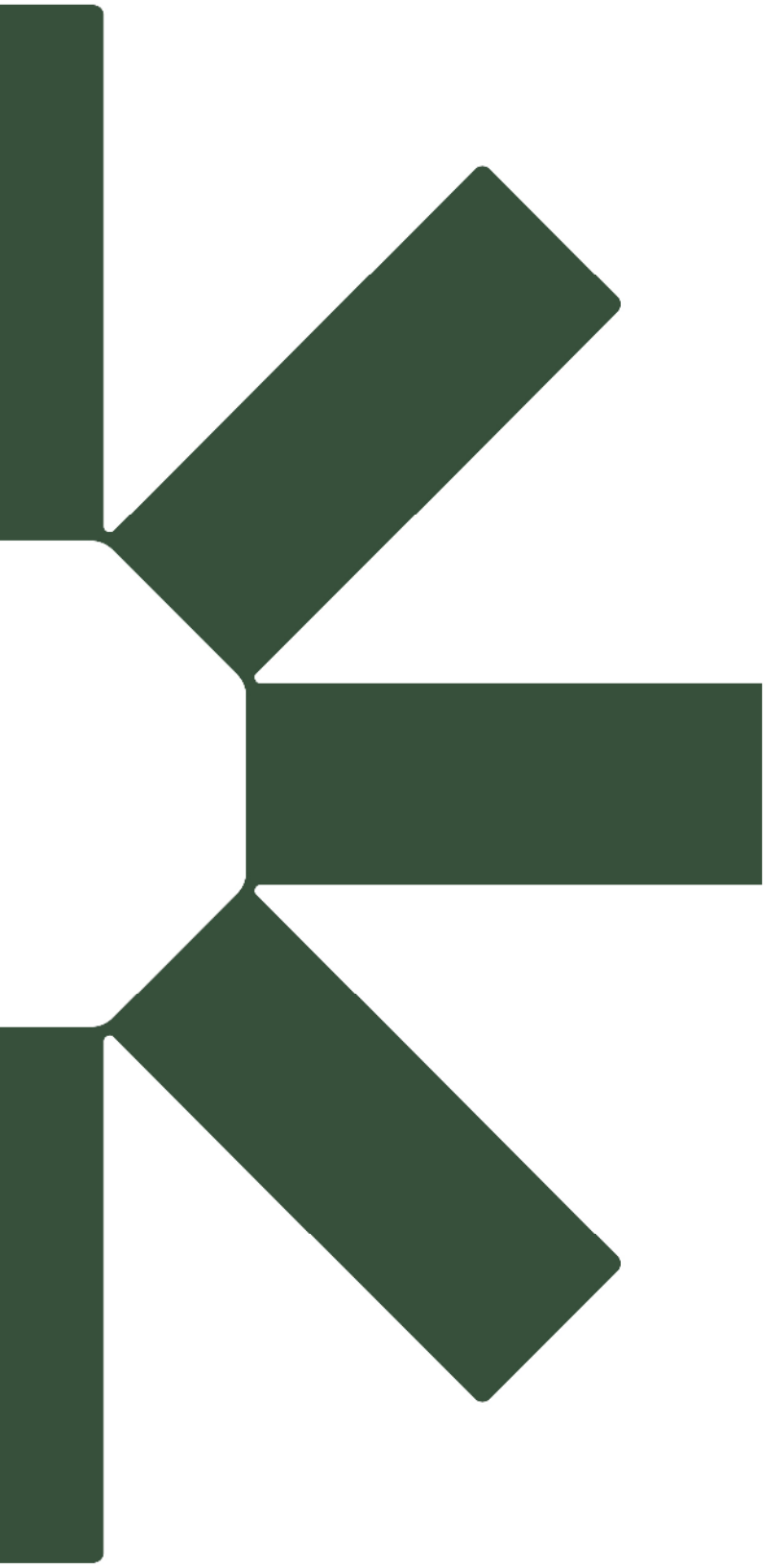
24 May 2026

Table F1: Land Suitability Assessment – SMU1

Crop	Barley-Dryland	Chickpea-Dryland	Cotton-Furrow Irrigated	Maize-Dryland	Millet-Dryland	Mungbean-Dryland	Oat-Dryland	Safflower-Dryland	Sorghum-Dryland	Soybean-Dryland	Sunflower-Dryland	Triticale-Dryland	Wheat-Dryland
Water erosion (E).	3	3	3	3	3	3	3	3	3	3	3	3	3
Erosion hazard, subsoil erodibility (Es).	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil water availability (M).	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow moisture range (Pm).	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface condition (Ps).	4	4	4	4	4	4	4	4	4	4	4	4	4
Rockiness (R).	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm).	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4	4	4	4	4	4	4	4	4	4	4	4	4
Land Suitability Class	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**

Table F-2: Land Suitability Assessment – SMU2

Crop	Barley-Dryland	Chickpea-Dryland	Cotton-Furrow Irrigated	Maize-Dryland	Millet-Dryland	Mungbean-Dryland	Oat-Dryland	Safflower-Dryland	Sorghum-Dryland	Soybean-Dryland	Sunflower-Dryland	Triticale-Dryland	Wheat-Dryland
Water erosion (E).	4	4	4	4	4	4	4	4	4	4	4	4	4
Erosion hazard, subsoil erodibility (Es).	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil water availability (M).	5	5	5	5	5	5	5	5	5	5	5	5	5
Narrow moisture range (Pm).	1	1	1	1	1	1	1	1	1	1	1	1	1
Surface condition (Ps).	1	1	1	1	1	1	1	1	1	1	1	1	1
Rockiness (R).	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm).	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	1	1	1	1	1	1	1	1	1	1	1	1	1
Land Suitability Class	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**



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